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BRIEFLY TOLD.

THE DIXON AND SHELTON PAPERS.—Our report of the American Association proceedings comprises two papers that are sure to be read with pleasure and to be remembered with profit. Before saying anything further as to their merits we would like to call attention to this report as it has so far appeared in our pages. We do not consider and never have considered that "rushing out" a mass of matter in short order is any evidence of enterprise. If the promulgation of error is enterprising we beg leave to be relegated to the unenterprising division, and prefer to have that name if we can only keep the records straight. Cold type is a most merciless Kodak. Figures may sometimes be other than what they seem, but type faces are absolute in their plainness, and are entirely devoid of the magnetism that causes personal speech to seem and to be not only fully indicative of one's meaning, but also to clothe it with regularity. The Guttenberg faces cannot grimace, neither can they gesticulate; and not to put too fine a point upon it, we have printed the proceedings with slowness simply because we desired that those who took part in the discussions, and who gave formal expression to that desire, might have an opportunity to look over the manuscript for the purpose of supplying any missing links. It is not fair nor could it be expected that Secretary Humphreys should perform the work of an editor in addition to his other duties, which latter are in all conscience sufficiently varied and complex to warrant the thanks of the members of the Association for the manner and thoroughness with which he performs them. With the further explanatory hint that distances in this country are great, and that the mails are "sometimes irregular," we will return to the original starting point, safe in the belief that our readers will agree with us that it is better to be right and slow than wrong and fast. Mr. Dixon's paper on the "Pintsch System" is well put together, and a most commendable feature about it which required much deftness of treatment from the very nature of the subject, is the absence of anything that might be construed to savor of advertising method. We believe that no one will dispute with Mr. Dixon in his statement that the Pintsch system gas has vastly the advantage over ordinary illuminating gas for the special purpose to which it is applied, and we imagine that great as the advances are that have been made in the Pintsch apparatus during the past 10 years, the next decade will witness still nearer approach to perfection in method of manufacture, in ease of application and in cost to the user. Train lighting has always been a ticklish task, and it would seem safe to say that Mr. Dixon's Company will eventually, if it does not now, hold the key to its unlocking. Mr. Dixon's first appearance in the paper arena must be voted a success.

Mr. F. H. Shelton, who wrote of "The Gas Engineer and his Pencil," was as usual, clear, cool and collected. It is true that his subject was one that the mere thought of would hardly be calculated to quicken the pulse and cause the gray matter to whirl; but as moments of ease and quiet are absolutely necessary to the full enjoyment of the livelier times, we think all will agree with us that Mr. Shelton can be cool at times and warm at others. We fear there are a great many gas men who would be constantly in the predicament of the traveler who sketched a mushroom, but was served with an umbrella, if they depended solely for the obtaining of their dinner by their ability to sketch the food they desired, but we need not be greatly cast down at this, since the gas man, to be a draughtsman, does not necessarily need to be a portrait painter. The draughting card is a wonderful mind trainer in methodical ways, and its finished products, in black and white tracings or prints, are wonderful assistants in keeping house about a gas works and its outdoor belongings. It was certain beforehand that Mr. Shelton's remarks would be explicit and complete; and it is true that they now stand "to prove the certainty."

MR. JOSEPH FLANNERY, at one time Chief Engineer of the Standard Gas Company, of this city, died at his home in New York, on the 15th

inst. Interment was made in Philadelphia, on the following Monday. We have in preparation some account of his career.

Fuel Gas.—A contemporary, in referring to the subject of "Fuel Gas," a fairly extended and carefully conducted trial of which will soon be on in Boston, says:

"The country looks to Pittsburgh for a practical settlement of the fuel gas question. If the manufacturers of that city whose supply of natural gas has been summarily cut off revert to the use of coal without a serious attempt to secure cheap fuel gas, their action will be accepted as strong evidence that gas is really not superior to coal for metallurgical purposes. This would seem to be at variance with the conclusions reached after a long trial of natural gas in many Pittsburgh establishments. When natural gas began to be used for raising steam, for operating puddling and heating furnaces, and for melting steel, the general testimony of those who could secure a supply was that it proved to be a most admirable fuel, being so easily controlled, and enabling just the precise heat to be secured when needed, and maintained with uniformity as long as it was wanted. So enthusiastic in the praises of gas were the first users that they asserted that practically a new education had been imparted to iron makers, and if through any accident the natural supply should be cut short, that those who had once realized the advantages of gaseous fuel would not again turn to the use of raw coal.

"At that time the permanence of the supply of natural gas was by no means established to the satisfaction of consumers generally, so that it can safely be presumed that just such a contingency as that which has recently happened at Pittsburgh was anticipated by the enthusiastic believers in the superior qualities of gaseous fuel.

"The use of natural gas at Pittsburgh has also continued sufficiently long to make every manufacturer thoroughly familiar with the method of handling it. The people of that great manufacturing center have been accustomed to the use of gas as no other set of people ever were. If there is any drawback to its use, or, on the other hand, if there is any extraordinary advantage gained by having fuel in such a form, the people of Pittsburgh may be presumed to know all about it. Both natural gas and artificial gas are used in a number of other localities by iron and steel manufacturers, it is true, but not to the extent or for the length of time that gas has been used at Pittsburgh.

"If, now, the manufacturers of that locality quietly re-insert the grates in their furnaces and in a wholesale way resume the consumption of coal in its raw state, as before the era of natural gas, that will settle the gas question to a considerable extent. The advocates of artificial fuel gas will have the weight of this apparently unfavorable action with regard to the use of that fuel operating against them, as it will naturally be assumed that the Pittsburgh manufacturers would instantly turn to artificial fuel gas if it could be cheaply produced, and if they were thoroughly satisfied that gas has decided advantages from a metallurgical standpoint over the use of raw coal.

"This is, or should be, a great opportunity for the designers of fuel gas apparatus to demonstrate the efficiency of their methods. It is a contingency which they have had in view and which has been awaited by some of them with a great deal of anxiety. A short supply of natural gas, or the concentration of the supply to meet the wants of domestic consumers, was expected to divert attention to fuel gas produced artificially. Should the Pittsburgh manufacturers adopt artificial gas appliances rather than permanently resort to the use of coal, it will not be long until iron and steel establishments in other parts of the country follow their example. If such methods are good for Pittsburgh they are good for other sections. The outcome will be watched with considerable interest."

Mr. C. S. Knight, of the Fort Wayne Electric Company, has just closed a contract with the Louisville (Ky.) Gas Company for an arc light plant of the Wood system. It is rated to a capacity of 720 2,000-candle power lamps.

Mr. Daniel Runkle, of Asbury, Warren county, N. J., died on the 17th inst., at the home of his son, Henry G. Runkle, Plainfield, N. J. Deceased was in his 67th year, was largely interested in the gas business, and was greatly esteemed. He was President and Treasurer of the Warren Foundry and Machine Company; President of the corporation of Runkle, Smith & Co., of this city; was the virtual head of the Havana (Cuba) Gas and Water Works Companies; President of the Alliance (O.) Water Works Company; a director in the Phillipsburg (N. J.) National Bank, as also in the Easton (Pa.) Bank; and a large shareholder in the Plainfield (N. J.) Water Supply and Plainfield Gas Companies, the Hackensack (N. J.) Water Works, and the Paterson (N. J.) and Rochester (N. Y.) Gas Companies. He was also interested in the Phillipsburg & Easton Railroad and the Thomas Iron Company.

[Continued from page 695.]

[Official Report—Revised by the Secretary.]

EIGHTEENTH ANNUAL MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.

Held at Savannah, Ga., October 15, 16 and 17, 1890.

First Day—Afternoon Session.

Mr. Robert M. Dixon, of New York city, read his paper on

THE PINTSCH SYSTEM.

An account of the Pintsch gas system involves a description of the apparatus (invented by the late Julius Pintsch of Berlin, Germany,) which has made the use of compressed oil gas a practical, economical, and satisfactory method of railroad car illumination. The use of oil gas for lighting cars, boats, floating buoys, etc., possesses distinct advantages over the use of a gas of lower candle power. Oil gas can practically be made of about 75 candle power, and this, after subjection to the losses due a compression to say 200 pounds per square inch, will still be from 60 to 65 candles, while 19 candle gas, after the same treatment, will not be more than 10 or 11 candles. The use of compressed coal gas has been tried on a large scale, and under the most favorable conditions, both in Europe and America, and has been decidedly unsatisfactory. The receivers, for carrying the gas under the cars, have to be of greater size, and the charging stations must be more frequent, and equipped with expensive compressing and storage apparatus of large capacity, some six times as much city gas as oil gas being required for a given amount of light. The cost, also, is in favor of oil gas. This can be made and delivered to cars, according to the Pintsch method, at a total cost of less than $2 a 1,000. City gas at $1.25 a 1,000 will cost put in cars, $2.35 a 1,000, and six times as much is required, making the relative costs as about 1 is to 8.

For manufacturing the gas and compressing it for delivery to the receivers under the cars, requires a plant consisting of a gas works, naturally of small dimensions, which may be located at any available place, and pipe lines connecting them with the car yards and stations. For the pipe lines three-fourths x strong iron pipe is used, and if the length be great, and quick charging of cars is desired, an accumulator, from which the gas is drawn for the cars, is placed at the yard. In laying the lines no provision is needed for draining or drips. All moisture and vapors are effectively removed during the process of compression.

The gas works themselves comprise furnaces for the production of the gas, some small condensing apparatus, a plate washer, purifiers, a station meter and gasholder, together with compressors and large store holders, into which the gas is forced and held ready for delivery through the pipe lines to the cars. Each furnace consists of a setting of two retorts, one arranged above the other. At one end of the furnace, a double mouthpiece connects the ends of the two retorts. The oil is fed into the other end of upper retort, and the outlet pipe for the gas is taken from the end of the lower retort just below.

The retorts are heated by a fire below them, separated from the lower retort by a fire-brick wall. The products of combustion pass along the sides of the lower retorts, heating them to the proper temperature for gas making, and before passing into the chimney along the sides of the upper ones, heating them also, but to a less degree, by the heat which would otherwise be wasted.

The cleanliness of the retorts is found to have considerable influence, not only upon the amount of fuel used, but also upon the yield of gas from a given quantity of oil. In order that they may be easily cleaned, each end of each retort is provided with a cover, and an iron pan is used in the upper, into which the oil falls, serving to prevent its coming into direct contact with the hot retort, and facilitating the removal of non-volatile elements contained in the oil.

The lesser heat of the upper retort vaporizes the oil, and in this condition it passes to the lower retort, the greater heat of which serves to bring it to the condition of a fixed gas. The gas passes to the water seals located below the level of the retorts, and in the conveying pipe is placed a try-cock for determining the quality of the gas that is being made. The amount of oil fed into the retorts is based upon the indications from the gas at the try-cock, and more or less supplied to accord with the temperature. After the gas is condensed, washed, and purified, it is metered and reaches the gasholder. The compressors are driven by steam and are especially constructed for the purpose intended. The gas is received by them from the gasholder, compressed, and forced into large storage cylinders ready for delivery to the cars.

The oil required for 1,000 cubic feet of gas made in these furnaces, is

from 13 to 16 gallons of crude petroleum or naphtha. Our men prefer to use Pennsylvania crude petroleum, and the amount of coal required in the furnace for producing this 1,000 cubic feet is about 100 pounds, of course depending upon the quality. For compressing the same amount, about 80 pounds of coal is required in the boiler for making steam.

Gas is carried on cars in receivers suspended underneath the framing of the floor. For cars with a total of 150 candles light, and not more than two nights service away from the charging plant, one receiver, about 9 feet long and 20 inches diameter, containing under 150 pounds pressure, which is our standard, about 200 feet of gas is sufficient. For cars having a greater amount of light, and in service on trips which carry them away from the charging plant more than two nights, additional receivers are used. Frequently 2 or 3, and sometimes a total of 4, receivers are used on each car.

On each side of a car is arranged a valve for attaching a gas supply hose, and this valve is connected by pipes to the receivers. It requires from 2 to 5 minutes to supply a car, or if more than one car is to be supplied at once, 5 or 6 can be supplied in as many minutes, provided they are all connected by hose to the gas distributing pipe lines at the same time.

In order that high pressure on the gas receivers made be reduced to the small one needed for the burners, and the latter be constantly maintained, a regulator is used. The Pintsch regulator will absolutely and automatically control all pressures from 1,500 pounds per square inch down to one-half pound per square inch, and maintain a constant pressure of about 1.4 inches of water at its outlet, no matter whether 1 or 100 burners are lighted, or whether all are shut off. The regulator is placed underneath the car, near the outlet of the gas receivers, so that all gas under high pressure is kept outside of the car and away from the ends, so that in case of accident they are not liable to be broken.

The principle upon which the regulator works is that of an equilibrium of forces. The high pressure from the receivers passes through a very small orifice at the inlet of the regulator, which orifice is closed more or less by a valve, held against it by a system of levers and links. The latter to connect with a leather diaphragm of 50 inches area, and a variation of from 1 pound to 500 pounds at the inlet cannot appreciably affect the outlet pressure. The leather of this regulator is especially prepared to withstand the destructive action of gas on such membranes, and experience has demonstrated the thoroughness of this treatment. Many thousands of them are already in use, and it has never failed except from abuse or the breaking of the cast iron case enclosing it.

From the outlet of the regulator the gas is carried along by a ½-inch pipe to some convenient place under the car, where a pipe leads it to the top of the roof. At some available point in the pipe leading up through the car is placed a main controlling cock, by which the flames of all the lamps can be regulated. The pipe passes along on top of the roof of the car, which branches off to each of the lamps or burners in the car. The gas supply to each lamp is also controlled by a cock.

The satisfactory illumination of a passenger car requires a sufficient amount of light so distributed as to give an even, brilliant light the entire length of the car. A lamp of high candle power is not used, and if used would not be satisfactory. A sufficient number of lamps should be placed in a car to enable reading with perfect ease at any part of it, and to do this properly it is necessary to have the lamps not more than a certain distance apart. If spaced too widely apart then the shadows at the point between the lamps are so great as to be inconvenient, and lamps of not extraordinary power are therefore more efficient in lighting.

If the attempt is made to light with lamps of very high candle power, then, in order that the proper amount of light may be had at the points of minimum lighting, other parts of the cars will be over lighted and over heated, and the amount of gas burned and consequent expense of lighting will not increase directly as the amount of over lighting, but according to the rule of squares. It has, therefore, not been the aim of the Pintsch system to use lamps of very high candle power, those ranging from 40 to 60 having been found sufficient. In fact, those of 40 candle power have been found the most satisfactory in even illumination.

The Pintsch lamps consist of the main body of the lamp suspended from the roof of the car either by a center column or by outside suspending arms. From a body is suspended a transparent bowl, which, with a white reflector extending entirely across the top of the bowl, with the exception of an annular space which serves as the entrance to the chimney, forms a chamber in which the gas is burned in fishtail flames. From two to six burners are used in a lamp, depending upon the light required at the location of the lamp in the car.

The upper part of the lamp consists of a glass crown or dome. The lower end of the flue or chimney of the lamp consists of a mica chimney, the upper end of regenerative passages. The light which escapes up the flue is reflected out through the mica chimney and the glass crown of the lamp, producing a pleasing and effective illumination of the ceiling of the car. The products of combustion pass up through the flues of the regenerative portion of the chimney, and the air for combustion is taken in near the top of the lamp and the top of this flue, and passing down outside of the mica chimney and between the reflector and a deflecting diaphragm, is highly heated before entering into the combustion chamber of the lamp. The effect of this absolutely shadowless and draught-proof lamp in car lighting is most pleasing, and produces a most brilliant and efficient light.

The Pintsch system is already applied to over 36,000 railway carriages, and is rapidly being adopted by the railroad systems of America. Gas works for the supply of cars are now in operation or course of construction at Boston, Stonington, Conn., New York, Jersey City (4), Syracuse, Marion, O., Chicago, Cincinnati, St. Louis, Denver, Ogden and Atlanta, and over 1,200 cars are lighted by this system in the United States.

Discussion.

The Chairman—You have listened to a very interesting paper. Will Mr. A. C. Humphreys lead off, and tell us how to make it profitable and practicable to the gas companies?

Mr. A. C. Humphreys—I suppose that the only way in which the established gas companies of the United States can make a profit of this business is by co operating with the Pintsch system—perhaps by operating their plants, which I understand companies are now doing at some points. I think it is a good idea. It is unquestionably the fact that we of the regular line are not equipped for this business. And still, I think we should not consider this an outside business; but we should be willing to encourage anything in any line that will take hold of and spread the gas business where we are not properly equipped for that particular work. I therefore think that Mr. Dixon is eminently one of us, and that his system should be encouraged by us. It is not perhaps amiss to note that the system as we have it in this country is by very long odds superior to what it is in the country of its birth, or even in the other countries around it. While we have to thank the Pintsch father and sons for the admirable way in which they have worked up the details of construction of their apparatus, they did not find it necessary to provide for very brilliant illumination in cars. It seemed to them wasteful to light a car as is done in this country by the Pintsch system. They cannot understand why it is necessary for us to use lamps with more than a single flame. There they depend, or have in the past depended to a great extent, upon travellers having their own pocket lamps. But we know that that will not do in this country. In England, also, it is not the habit to provide illumination in the cars to the same extent as is done here. It is only fair to say that great credit for what has been done here in the development of the practically efficient lamp now used by the Pintsch system is due to Mr. Dixon. I think it would be well to forestall criticism on Mr. Dixon's part for him to say that in comparing the cost he is comparing the bought gas with the manufactured gas. But that is a small matter, as it is unquestionably very much cheaper to light a car by means of compressed high candle power gas than it is by low candle power gas. We know that by experience in our own line. We are compressing at some of our stations ordinary city gas, but the cost to the consumer will not compare favorably for this purpose with the cost of lighting by the Pintsch system. I think that the point made by Mr. Dixon with regard to the way that the lamps should be distributed in the car cannot be questioned for a moment, for, especially in car lighting, we must secure a uniform distribution of light. I think if any gentleman here has occasion to examine a car lighted by this system in this country, he will find that he can sit and read in any of the seats of the car, and if he can for the moment forget where the lamps are placed, I doubt if he by the effect on his page can tell where the lamps are located. That may seem to be a strong statement, but I think that observation will verify what I say. I do not want to close without saying a word about the Pintsch regulator. I suppose that the credit for this instrument is entirely due to the Pintsch family. I do not know that any changes have been made in this country. I think it is about as near perfection as anything that we can use. Some of the stories that I have told about the regulation of gas by the Pintsch regulator are such that I am afraid that some of my friends are almost willing to doubt my veracity; but I know that it has done work for me that I could not in advance have believed to be possible.

The Chairman—Mr. McMillin will please add a few words.

Mr. McMillin—I do not think that I will carry on the discussion fur-

ther than to make this remark: The question might arise in the minds of many gas people here, "Why do large gas companies care to bother with the little Pintsch system in works for lighting a few cars?" That is the question which would naturally be suggested by those who have not fully considered the matter. I do not know whether there is any profit in the business; and although the figures presented show a very handsome profit, I am unable to accept them in good faith. But, whether there is a profit or not, I feel that it is absolutely dangerous to permit anybody but a gas company to have even a small gas works in your city. You do not want any other man to start works in a little place where he can make even a few hundred feet per day, because the demand for the gas will keep growing and growing, and he extends his works, and after a while you will have a competitor. It was to prevent anything of that kind, more than it was for the sake of the money that was in it, that induced me to undertake it in St. Louis. I am frank to say, however, that I believe it will be as profitable as any other branch of our business.

Mr. Dixon—Mr. Humphreys and I had no arrangement of "you tickle me and I will tickle you," but I want to say that I owe it to Mr. Humphreys in being started in the right direction in this system; and that it was he who did more than anyone else to bring the system up to what was demanded by American railroad companies.

Mr. Boardman—Before giving up my position in Macon I had been working to put in a small Pintsch works there for the purpose of lighting the cars on the Central Railroad system and other railways centering in that place. It occurred to me that not only could it be useful in this particular way, but that it might be used to advantage as an educator and feeder for my regular gas plant. To my mind, in all cities, and especially here in the South where the cities are growing rapidly, a large portion of new territory is being built upon by the better class of people who desire to get away from the noise and dust of the busy streets with which we are troubled in this climate, but who, being beyond the reach of our mains, and likely so to be for a number of years, and until the district which they gradually people has been built up sufficiently to pay the cost of running a main there, are practically without gas unless they introduce oil gas systems, or greased air systems. I accordingly thought it might pay to educate these people, to get them to put gas pipes, chandeliers, and fixtures in their houses, and thus become gas consumers finally, by furnishing them the Pintsch gas, by delivering it to them in wagons, weekly or monthly, in smaller cylinders than are employed by the power companies. Then when the time shall arrive when we can afford to lay mains in that section we shall secure them permanently as educated gas consumers.

Mr. Somerville—If you go to a railroad company for this business, and say that you will light their cars as cheaply with gas, and that you will give them a much better light than they are now paying for oil, they naturally expect that it would be profitable for gas companies to do it at that rate.

On motion of Mr. McMillin a vote of thanks was tendered to Mr. Dixon for his paper.

The Association then adjourned to Thursday, Oct. 16, at 9:30 A.M.

SECOND DAY—MORNING SESSION.

The Association met at 9:30 A.M., President McMillin in the chair.

The President opened the proceedings by reading the following telegram:

"To the President of the American Gas Light Association:—Charles Hunt, of Birmingham, England, sends from Birmingham, Alabama, greeting to his American brethren assembled at Savannah, and heartily wishes them a successful and enjoyable meeting." (Applause.)

Mr. F. H. Shelton, of Philadelphia, read his paper entitled

THE GAS ENGINEER AND HIS PENCIL.

Mr. President and Members of the American Gas Light Association—Gentlemen:—To take a slight liberty with an old proverb (by omitting one letter), the successful gas engineer may be said to be a veritable "Jack-of-all-trades and master of *one*." For most of us recognize that the modern gas man must have at least a smattering of knowled-e of many callings besides his own, and that to successfully keep the public satisfied and his stockholders happy he must at various times act as lawyer or lobyist, diplomatist or politician, financier or economist, mechanic or engineer, chemist or electrician, architect or draughtsman, as the case may be; and, in short, have knowledge of a thousand and one points beside his direct craft of how to deliver gas at the burner at the lowest possible figure.

In selecting the subject that I have I wish to call to your attention the importance, from a gas standpoint, of one of the vocations above of which the versatile gas manager is supposed to have some knowledge, and which I think is but too often unappreciated and neglected. I refer to the gas man as a draughtsman, and in offering the suggestions that I shall, I desire to say that they are chiefly for those who may, perchance, be unfamiliar with the subject from lack of a technical education, and for those who, from having a works too small to support a regular draughtsman, find that whatever work of this nature is to be done must be done by themselves.

If one but stops to think of this subject it is almost self-evident how desirable and important the ability to use the pencil is to a gas man, whether managing but an oil gas plant or the largest works of a metropolis, for the economic and satisfactory carrying on of his work. Plans of works and of buildings; drawings of firebrick work, of apparatus or connections; maps of street mains, etc., are often to be made, and all bespeak the importance of knowing how to clearly depict the same. The knack of sketching or quickly setting forth one's ideas by a few lines is of almost daily use, and whether one is chalking the outline of some shape of iron on a blacksmith's floor, or is sketching on the back of an envelope an odd connection to one's foreman, he wishes to succeed in conveying the idea and to be more successful than the traveler in a restaurant abroad, who, desiring to have some mushrooms, and unable to speak the language, made a sketch of one. The waiter, apparently comprehending, rushed off and returned with *an open umbrella*.

Very many gas men do almost nothing in the way of draughting, and very many works are lamentably lacking in plans and records that should most undoubtedly be on file. I believe that if more attention were paid to this detail of the business the effort would be well repaid, and it is my hope to show in this paper, in calling your attention to the subject, that the matter is not such a bugbear as some may imagine—that the skill of a professional and accomplished draughtsman is not required, nor a costly lot of instruments, but that a moderate degree of skill, with some little care and system and a few standard instruments, will be all-sufficient to enable one to properly make and keep the "pencil records," so to speak, that I think ought to be kept, and which I shall point out.

Regarding instruments: A drawing board, or broad, flat-topped and firm table, a T-square, one or two triangles, a scale, a dozen thumbtacks, a moderate-sized pair of compasses, with pen and pencil attachments, and a ruling pen are really all the essential implements required. I advise, however, on account of their great convenience, the having, in addition to the above, of a small pair of spring dividers, a scale, an "irregular curve," and a larger pair of compasses with extension leg for large curves and circles. The following cut (Fig. 1) shows such an outfit complete.

The drawing board or table is best, of course, with trued and squared edges and sides, from which to work the T-square in any direction. If unable to secure such, however, true and vertical lines at right angles with the horizontal can be readily made by working with the T-square from the left hand edge only, and using the triangles along the edge of the square, as shown in Fig. 1.

Paper of any style preferred and liquid India and colored inks can now be bought at almost any stationery store, while pencils and rubber erasers one usually already has. Five dollars to ten dollars will cover such an outfit, excepting the table. Of course, any amount of money can be spent for a greater variety of instruments, for greater convenience, or for special work; but precisely as Benjamin West painted his first great picture with a brush made from hair from the tail of the household cat, and as some of the finest specimens in taxidermy have been prepared in the forest on the tailboard of a wagon, so will you find that while costly paraphernalia is certainly convenient, yet it is not *necessary*, and that the great bulk of the work in draughting can be done with the tools mentioned above.

There are three general directions in which I think the pencil of the gas engineer should be exercised in a well managed company, viz., "The Works," "In Distribution," and "At the Office."

The Works.—One of the most fitting things, and one that is at the same time both useful and ornamental, that can be hung in the gas office, is a well drawn and neatly framed "property plan" of the gas works. Many may doubtless say that they "know every inch of the works," and do not need such. Possibly. But I venture to say that if, to prove this belief, you attempt to draw even a general plan of the works, and put in the data from memory, you will find that you do *not* know a great deal that you think you do, and will soon be looking up the facts; and that if you do make such a plan you will be surprised at the number of times that you will use it, and will not willingly relinquish it. When cogitating upon changes at the works, such a plan helps wonderfully; and whether demonstrating to the ubiquitous insur-

ance man that your works are more safe from fire than Gibraltar, or to the tax collector that there is really nothing at all worth assessing at the works, or whether you are in correspondence with some constructing firm to which you wish to send a plan of building or works, or are simply talking with your foreman regarding changes in apparatus or connections, you will find it equally useful and convenient, and saving many trips to the works.

Such a plan should be pre-eminently an accurate record of the chief data of construction and arrangement of the works, and to lay out and make such I herewith offer the following suggestions as to method that may be followed and points that should be embodied:

First, get the exact property lines from the original deeds, which should be in the archives of the company in the safe. Then, for curiosity's sake largely, take an accurate tape line (steel or wire woven preferred) and a small boy to hold the end of it, a pad and a pencil, and a half day's time, and check off the property lines by actual measurement, noting how nearly correctly located or not your fences may be. If the lines do not agree, the city engineer or surveyor should be called in to verify the facts. Remember that, in certain States at least, the law is such that if part of your land has been unused by you for 20 years, it is liable to claim by your neighbor, if during that time he has had the use of it, without protest (unless, of course, by permission), and is disposed to so trouble you. Then, with the tape line, take the exact location and measurements of all buildings; the size inside of all rooms; the location of all doors, windows, stairways and pilasters; the depth of cellars; the height to eaves; the location of all apparatus and connections, and of every valve, and of all joints accessible. Locate your gates, driveways, water service (and stop-cock in same), sewers and drain pipes, oil pipe line from railroad and railroad switch, if adjacent. In short, secure everything by measurement that you can think of, and constantly take several measurements from different points to the same object, in order to "tie in" and check your work. You can hardly get too much; and the more complete the finished plan, the greater will be your satisfaction.

When ready to make the drawing, determine upon the scale. Do not have your sheet too small, but of such size that the data and notes and drawing proper can all be put on without an appearance of crowding. For a small works, a scale of 8 to 12 feet to the inch, on a sheet perhaps 36 by 24 inches is a good size. For larger works, of course the sheet must be enlarged in proportion, until, if necessary, it is 4 to 6 feet square. I have noted very admirable property plans of this approximate size in the offices of the Boston, Montreal, St. Louis, and other companies.

In making the drawing and transferring the data to the sheet take time and ensure accuracy, and thus avoid the soiled effect that follows if you have to erase ink. You will be surprised, as you go along, at the number of little changes and corrections that you will make, and as you can not erase ink satisfactorily, have everything *right*, in pencil, before touching ink. When inking in, put in all underground pipes, etc., in dotted lines, and indicate the depth of such, when known, by numerous little figures such as this, $\frac{3}{}$ (the figure under the horizontal line indicating *the depth beneath the surface*, of the pipe at the point in question). Put in all the rest of the work in full, clear lines, and the walls of brick or stone buildings in solid black, if you so please. Or, if you are good at coloring, the walls may be painted, after inking in, with a light wash of red or gray, according as they are of brick or stone. The main gas pipes may be colored in the same way, an iron gray, the drain pipes a terra cotta or light brown, and, if in great detail, the steam pipes blue, the water pipes green, and the oil pipes red. The apparatus proper may be then shaded and colored according to the respective part, and the grass portion of the works given a wash of very light green. Such a plan as this can, of course, be elaborated indefinitely almost, according to the skill of the artist. When neatly done everything stands out in good relief, and all the connections, etc., may be traced with great ease. When all is completed put on your notes, in neat lettering, with pen and ink.

This whole work is primarily a record for reference, and I believe that in addition to the usual general measurements, the following, and all such kindred memoranda should appear, viz., the size inside of all rooms; the distance in the clear in gates and driveways; the distance between buildings in the clear; the names of streets or railroads, or of rivers or other water, and of property owners adjoining; whether the water service is city or private; ditto, regarding sewer; railroad switch—whether owned by the gas or the railroad company; if switch is elevated, height of rails above coal shed floor; capacity in tons of coal shed; diameter and height of each holder or holder lift, and working capacity of same; pressure cupped and uncupped; diameter and depth of holder tanks; diameter, depth and capacity of oil, water, and ammonia tanks; harbor line; depth of water off dock at high and low tide; height of dock still above water at mean tide; names and makers' names of each part of the gas apparatus, year installed, and capacity of same; horse power of engines and boilers, and speed required on blower for given pressure, etc. I presume some of you will think that I am unnecessarily particular in recommending such detail (and I grant that the gas manager is supposed to carry the greater part of this in his memory), but it is just such points as these that are constantly, for the moment, being forgotten. At such a time a glance at a plan, as outlined above, may save a trip to the gas works to get the information desired, or much vexatious delay.

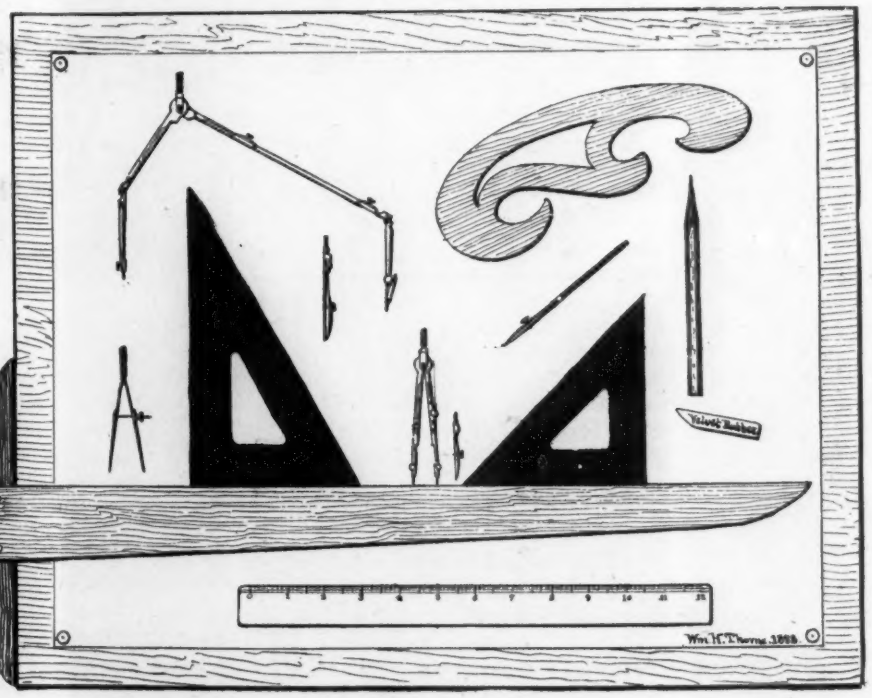


Fig. 1.

I am sure, also, that should any unexpected change of administration occur, the incoming superintendent would be very grateful to his predecessor for such information so well recorded.

In finishing up the plan put in an arrow to indicate the points of the compass, and a title in clear lettering. Frame and hang by wire, not

by cord. Rust will not affect it, and moths will not corrupt it and cause all to come down with a crash, as I have known to occur.

I give herewith a cut (Fig. 2) which shows the general appearance of such a plan as I have in mind. Owing, however, to the small scale upon which it must necessarily here be drawn, I have been compelled to leave off very many measurements and memoranda which should appear upon an actual full-sized plan.

A plan as above, I believe, should be on record in every gas office. It should be supplemented by like property plans of any outlying holders or other property of the gas company, and any elevations of holder houses or buildings or photographic views add to its completeness.

In addition, plans and drawings of all apparatus at the works should be kept safely at the office, for reference in case of repairs, relinings, alterations, etc. Such plans of the detail of plant and apparatus the gas manager is usually not called upon to make himself, but can get from

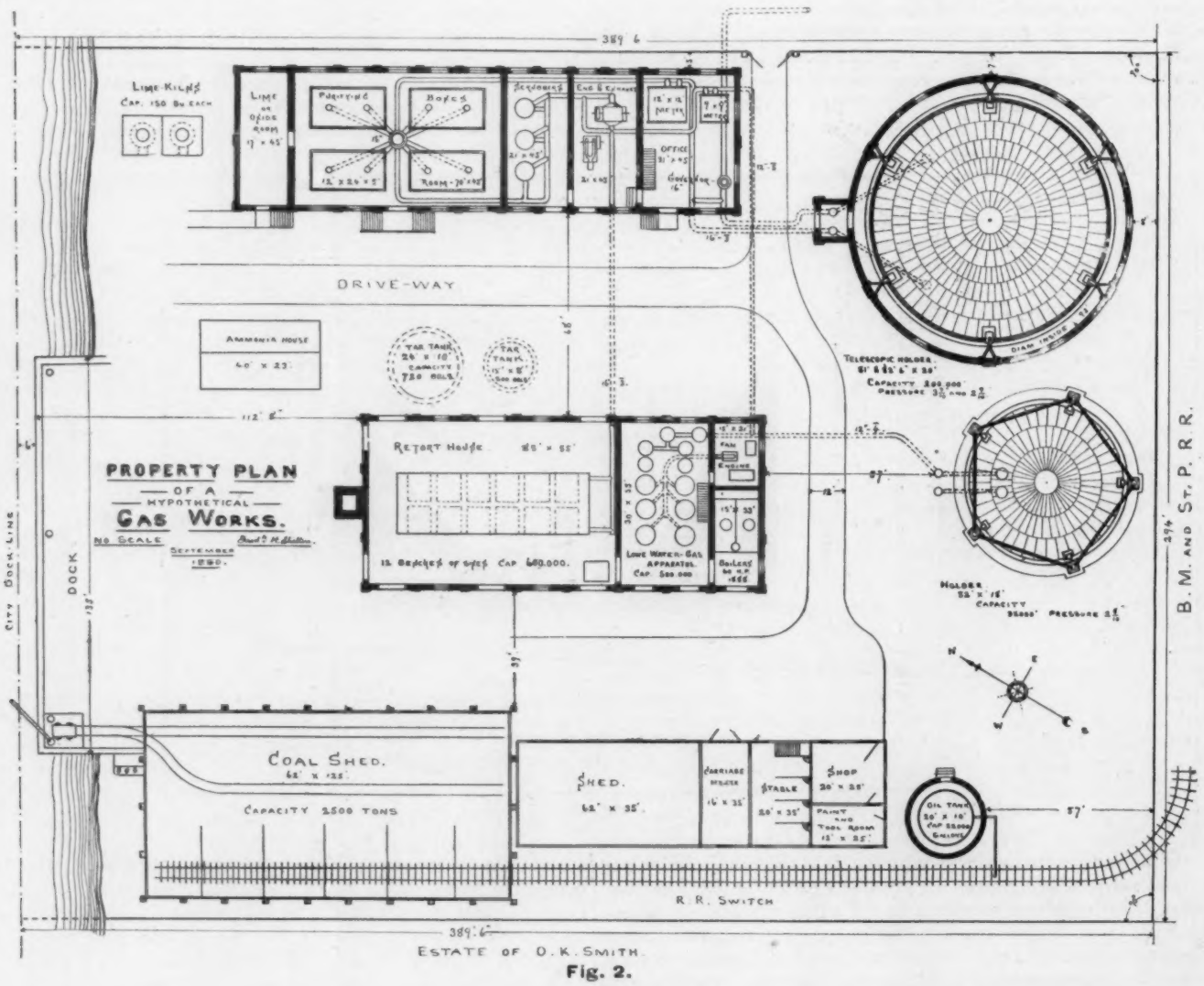


Fig. 2.

the constructors of the parts in question at the time of erection. In this latter case, see that the drawings as secured are corrected in accordance with the many little changes almost sure to have been made in course of erection.

Distribution.—Whatever may be said *pro* or *con* about the importance of the foregoing, there can be no question about the necessity of full and complete records of street mains.

How many of us are dependent upon our foreman for this most important knowledge; and how many of us would be caught if such foreman should unexpectedly strike, leave us, be taken i'l, or die? I hold that there should be in every gas office complete records of every foot of main and of every special; of every service, lamp post, drip and valve, so that in case of the defection of the street man for any reason, the superintendent has the knowledge on record with which to instruct his successor.

The whole subject of street main records is an exhaustive one, and I can here refer only to the portion in which the pencil of the gas engineer comes into play.

The foundation of such records is a large, complete, and correct map of the city or territory supplied. Such a map can nearly always be found or else made by enlarging a small one. If this latter is necessary, perhaps the easiest way for the gas man to do it is by the system of squares. In this method the smaller map is ruled off into small squares, and each one of these is then readily transferred by copying on to the larger sheet on the scale desired. On the large map every foot of street main should be indicated, in the proper streets. These mains may be shown by lines of one color with figures written over them to denote the size of pipe, or they may be put in with various colored inks and combinations of dots and dashes for the different sizes. In this latter case a key to the colors, etc., should be put in one corner. The latter is much the more preferable way, and I am disposed to recommend the following plan as one of the best for carrying out the detail. The leading feature of the plan, is to show to the eye by a glance, when familiar with and by a careful selection of colors, the general size of the mains in any district

For instance—we start from the gas works with some dark colored line (as purple or blue) to indicate our largest main. As the main gets smaller the line is broken by dots and dashes, giving a lighter effect to the eye, and indicative of the next smaller size pipe. After say three sizes of pipe have been so indicated by different combinations of dot and dash, but all of the same color, a lighter color is used in the same manner for the next three smaller sizes and so on down, until the lightest color attainable (yellow) indicates the smallest, or 3 and 2 inch main. For 1½-inch, and 1¼-inch "main" so-called, or for large service pipes I prefer to write the size in small figures right in the colored line rather than multiply colors. A main system so depicted shows very clearly to the eye, by the gradual lightening of the colors, the decrease in the size of pipes as one gets away form the gas works and can usually be indicated by the use of but 3 or 4 colored inks.

Using, say, purple, blue, red and yellow, it would appear somewhat like this :—

30-inch main, ——————————
24 " " — — — — — — — — — — } Purple.
20 " " - - - - - - - - - - -

16-inch main, ——————————
12 " " — — — — — — — — — — } Blue.
10 " " - - - - - - - - - - -

8-inch main, ——————————
6 " " — — — — — — — — — — } Red.
4 " " - - - - - - - - - - -

small scale upon which it must be drawn, no detail is possible. To cover this point the usual plan is to have a series of cards or sheets, each showing, on a large scale, a square or block of main. These are arranged either by street names, alphabetically, or else are numbered to correspond with numbers on each block or intersection on the main map. Thus equipped, one can turn almost instantly to the card showing the enlarged detail of any block of pipe desired, and there find also the detail of every service, drip, lamp post, valve, or special in that block. Upon these cards should also be noted memoranda or sketches of all the special outside things that one comes in contact with in street work, such as tunnels, water pipes, other companies' gas pipes, sewers, cisterns, cable conduits and electrical subways, detail of crossings at bridges, railroads, etc., etc. The location of valves, and where keys or wrenches are kept, should also be noted, so that in case of fire the district may be quickly shut off by the superintendent or person under his direction, in case the street foreman should be at the time inaccessible.

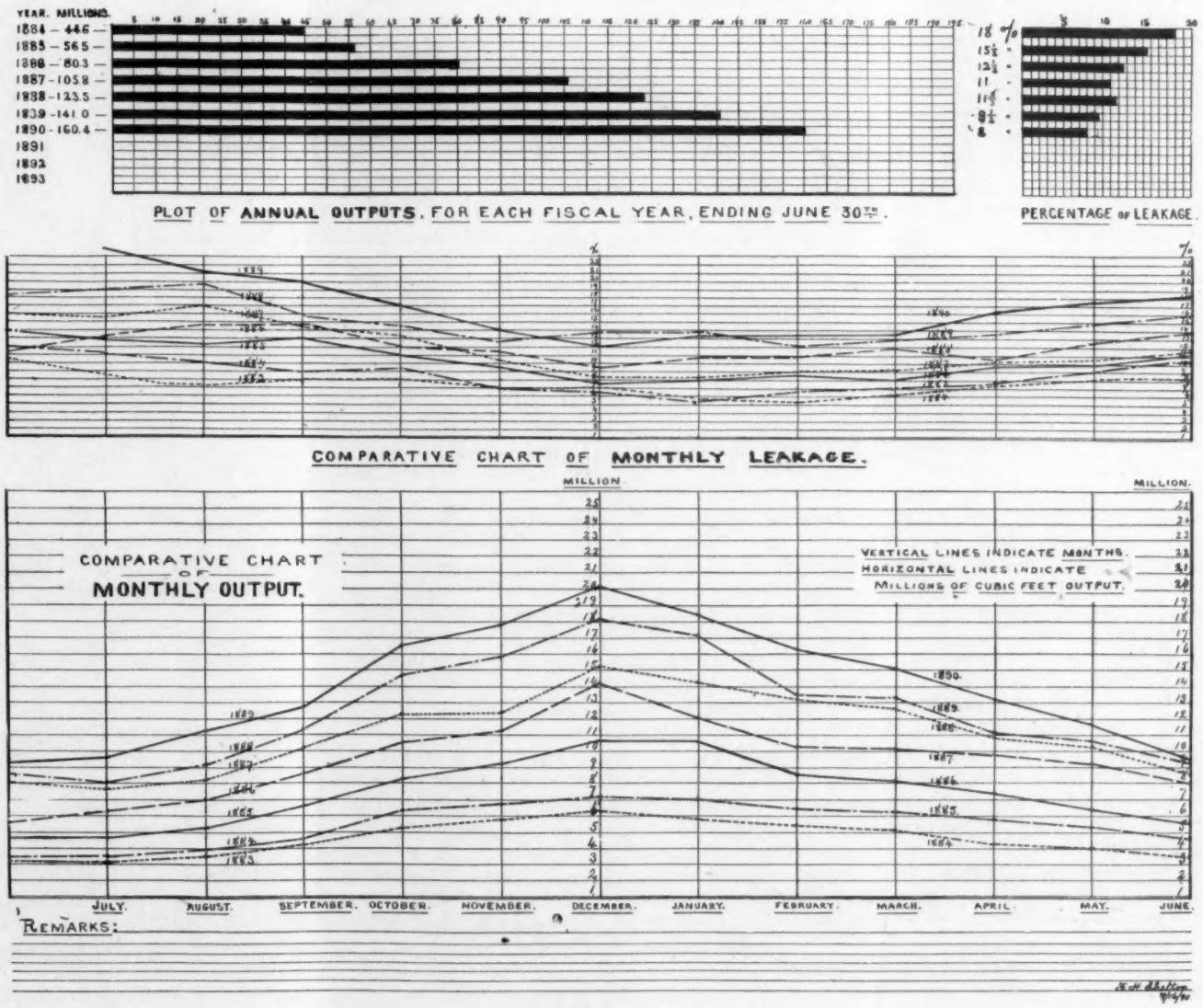

YEAR. MILLIONS.
1884 – 44.6 —
1885 – 56.5 —
1886 – 80.3 —
1887 – 105.8 —
1888 – 123.5 —
1889 – 141.0 —
1890 – 160.4 —
1891
1892
1893
PLOT OF ANNUAL OUTPUTS, FOR EACH FISCAL YEAR, ENDING JUNE 30TH.
PERCENTAGE OF LEAKAGE.
COMPARATIVE CHART OF MONTHLY LEAKAGE.
COMPARATIVE CHART OF MONTHLY OUTPUT.
VERTICAL LINES INDICATE MONTHS.
HORIZONTAL LINES INDICATE MILLIONS OF CUBIC FEET OUTPUT.
JULY. AUGUST. SEPTEMBER. OCTOBER. NOVEMBER. DECEMBER. JANUARY. FEBRUARY. MARCH. APRIL. MAY. JUNE.
REMARKS:

Fig. 3.

3-inch main, ——————————
2 " " — — — — — — — — — —
1½ " " —— 1½ —— 1½ —— 1½ —— 1½ – } Yellow.
1¼ " " —— 1¼ —— 1¼ —— 1¼ ——
1 " " ——— 1 ——— 1 ——— 1 ———

For those who prefer finer distinctions, the rainbow spectrum will furnish the key to the gradual grading of the colors.

Upon this map should also be shown, by appropriate symbols, all valves, drips, and lamp posts. I am also in favor of indicating the different levels of the city upon the map. Such information can usually be obtained at the City Engineer's office, and is at times very useful when questions of pressure arise—in fact, is almost necessary in many places of widely varying altitudes.

The map as above is excellent, as far as it goes, in showing the distribution and mileage of mains, etc.; but, of course, from the necessarily

All these cards or sheets, if of uniform size, may be bound in book form (in such a manner as to admit of the insertion of additional sheets as additional main is laid), with blank or ruled pages between every sheet, upon which may be kept the record of the cost of laying the main in question, in itemized detail, and all the measurements pertaining thereto. Such a book thus forms in conjunction with the map a complete record of the distribution system.

In this connection a practical "wrinkle" is to transcribe into a small book for pocket size, say 4 by 6 inches, sketches showing the location of every drip and street valve, for the special use of the street man. This is a most convenient form for him to have such information in, without being encumbered with unnecessary data, and saves him many a trip to the office. This book may also be used to keep the record of pumping of drips. A duplicate should be kept in the office.

Among some companies, in connection with the large map above in-

dicated, a smaller map is sometimes kept showing simply the "trunk-line" mains, or nothing smaller than 8 or 10 inch. This is frequently a convenience in studying out problems of distribution, and is especially important in large cities.

The proper and complete record of street mains is a matter of the greatest importance, and the opportunities as indicated above for the use of the pencil are manifest.

The Office.—I wish to call to your attention a direction wherein a pencil of the gas man may come into play at the office; draughting, which while perhaps not as important as the preceeding work indicated, yet, to my mind, is of great interest and well worth the doing. That is, the graphical plotting into charts of the figures of output, leakage, or other data, for monthly and yearly record, reference. and comparison.

There is nothing like a cold fact in black and white, constantly before one's eyes, to spur one on to renewed efforts, and I think that plotted charts of what we may be doing, serve a distinct and useful purpose in that way. If, for instance, on such a chart, the line indicating the percentage of leakage should take a sudden rise, it must be an eyesore to the conscientious superintendent until he can restore it to its normal position; or, if the line indicating the output for a just closing year shows not the usual growth over that for the preceeding year, it is a constant reminder and incentive for him to watch more closely every means by which he may increase his consumption.

To make a graphical chart of this nature is not difficult. On a large sheet of paper, lay off a base line, say 24 inches long. At intervals of two inches erect perpendicular lines, say 10 inches high. Then across these lines and parallel with the base line draw a series of lines, say a quarter or a half an inch apart. Your sheet is then ruled both ways. The vertical columns represent months, the horizontal divisions thousands or millions of cubic feet of gas output, according to the size of your company, and should be so marked. A convenient paper for this purpose is what is known as "engineer's paper," which can be bought already ruled in both directions in fine blue lines one-tenth of an inch apart. As many of these lines can be taken as needed, for a given space desired, and heavier ones ruled in to suit the works or data in consideration.

It will be readily seen that if your output for January is 10,000,000 and a mark be put in the tenth horizontal line in the column for January, and if your output for February be 8,000,000, and a mark be put in the eighth horizontal line in the column for February, and so on throughout the 12 months, and a line be drawn through and connecting all these 12 points, such a line will represent very clearly the fluctuations of one's output for the year. The succeeding years' output should be put on the same sheet in the same way; and it will be seen that if the output is increasing, and is, say, a 1,000,000 feet or so larger for each month than the preceding year, the second year's output will be proportionately higher up on the sheet, and opportunity for most direct comparison given. If the annual outputs do not vary much, and the lines cross and recross, colored inks should be used for the various lines in order to preserve clearness. The lines for a series of years so plotted make most interesting and instructive data, and show very clearly the progress of the company. When abrupt changes in the output occur and the line has noticeable fluctuations in it, the reason should be stated in a foot note. For example—"Potamac Mills closed for two months;" "eighty-two lamp posts disconnected this month," or, "gas stove business entered upon, this date," etc., etc.

This plotting of the output by months as above is usually the chief feature of the sheet. Additional spaces, however, should be ruled off into appropriate size for the plotting of the yearly outputs, and especially for the plotting of the monthly percentage of leakage. The direct showing of this latter item I consider as perhaps the most important matter on the sheet. There is no getting away from it, and its tendency, from its "silent action" on the superintendent's mind, toward the reduction of the leakage account is most beneficial. Plotting may, of course, be carried out to a much greater extent if desired. The percentage of annual increase of output; the daily, the weekly, or quarterly outputs; the number of meters in use; the number of gas stoves; the yield per pound; all such figures may be graphically delineated at the fancy of the superintendent, if so disposed. It is also well to have a column at one side of the sheet, in which to keep a record of monthly station meter readings, and another in which to note the estimated annual population of the city. I give herewith a cut (Fig. 3) showing a few samples of such plotting.

In framing, the sheet should be so arranged that it can be readily removed, in order to make the monthly continuations of the lines or other entries.

If well planned at the start, such a chart may be made to cover a period of 10 years or more; and if well kept up it not only furnishes constant food for reflection, as it may be studied, but becomes, in a degree, a visible history of the progress of the company. I believe it to be well worth the keeping.

In closing, I wish to disclaim more than a very moderate amount of knowledge of the subject of which I have written, and to apologize to those to whom I have, perhaps, said nothing new, knowing that all of that which I have recommended is practiced in some companies, while to others much of what I have said will not apply. At the same time there *are* some companies which would be bettered were the pencil of the gas engineer used more freely—bettered in themselves from having the benefit of and the satisfaction of complete records, and in the eyes of others from the fact that if work in this direction is seen to be thorough, it argues thoroughness throughout.

To the managers of such companies I would emphasize once more the desirability of keeping all possible pencil records. Even if you feel, perchance, that exact and elaborate drawings are beyond your ability or the time you can give to this work, then make free hand sketches. Such rough drawings are far better than none at all, and in some cases are even better than an elaborated drawing to scale, as they permit of the enlarging and bringing out the more clearly of certain prominent points, or a central idea, if so desired. Free hand sketches, however, when not drawn to scale should have the measurements all the more fully and more clearly marked upon them.

To those of you who desire a good and simple treatise upon draughting I would recommend a series of papers entitled "Lessons in Mechanical Drawing," that appeared in the *Scientific American Supplement*, in 1876 and 1877, by Prof. Charles W. MacCord, of Stevens Institute, Hoboken, N. J. (since issued in book form by Munn & Company, N. Y.), and to a series of three hand-books entitled "Junior, Intermediate and Senior Courses in Mechanical Drawing," by Wm. H. Thorne, M.E., Director of the Drawing School of the Franklin Institute, Philadelphia, Pa., 1890. (Williams, Brown & Earle, Chestnut and 10th streets, Philadelphia).

If in any of you I have awakened the draughting conscience, or to anyone been of service by suggestion, I am well pleased.

Discussion.

The President—You have heard read a very interesting, and, to my mind, a very profitable paper, that I trust will be thoroughly and expeditiously discussed. Mr. Shelton is ready to answer any questions that may be asked him.

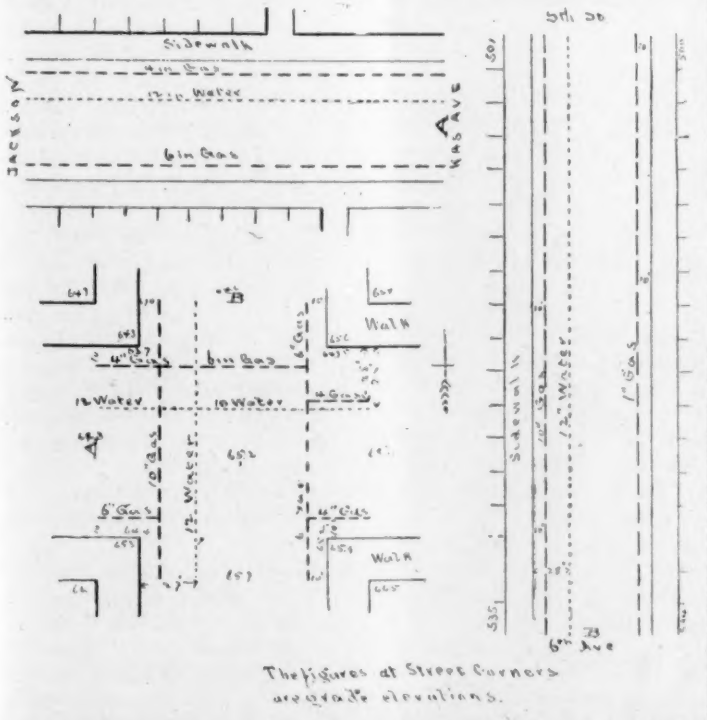
Mr. Egner—Only a few days ago I had a little example of how much memory is worth and how true Mr. Shelton's remarks are in the matter of how beneficial it would be to put designs down on paper. Coming along on the train a friend said to me, "Mr. Egner, can you draw the face of your watch?" I said, "Yes; no doubt I can." My friend remarked that it seemed to be not very much of a thing to do, but that there was a good lesson attached to it. I took out pencil and paper and drew the face of my watch—I thought I could not make any mistake in that, as I saw the face of my watch many times every day—so I drew the face of my watch, correctly, as I thought. In fact I thought I had made a very nice sketch of it. I handed it over for inspection, and was then asked to show my watch, when, to my surprise, I found that it was as unlike the drawing as could be. *This* part (the chain ring) was not where it ought to be at all, for I drew it *there* (about half-way to the right of its proper position), and even the figures were wrong. How much more can we be mistaken in our more complicated gas works, even though we see them every day. We think we know just where every valve, pipe or drip is, but the time may come when we will find that we are mistaken. Therefore I think the suggestion of Mr. Shelton, that we should have sketches of everything about the gas works, is a very good one, and has been done no doubt by most gas engineers in the past.

Mr. Mooney—I agree with all that Mr. Shelton says about having plans and maps, and I would have the office plastered with them; but I think they need not be made by the engineer of the works. He has other things to do. He is paid a high salary, so the company could not afford to have him spend his time making plans. He is compensated for doing other things. Again, I don't think you can teach these bald-headed men by getting drawing boards and getting them to go to work and take lessons. They will not do it. They have no time for it. It is a thing that has to be learned from youth. I think the engineer has too much work to do now, and he cannot afford to go to work and learn how to draw plans.

Mr. A. C. Humphreys—I would like to reply to Mr. Mooney. I think it would be a very sad thing, after hearing that excellent paper read, for any one to go away with the impression that he cannot do

the work that Mr. Shelton has mapped out. As Mr. Shelton says, if you have not the time to devote to the study, so as to be able to make a regular mechanical drawing, you can do the same work by free-hand sketches. There is not a man in this room, who, after studying for three months in the evenings, cannot do practically everything that Mr. Shelton asks for in that paper. I say that without any reservation at all. It is not necessary that he should make a finished drawing. He simply wants to record the facts. One of the most important things in that paper is the pointing out of the fact that it is not necessary to make these drawings to scale; but if a man cannot do any better, he can have systematic order about it, and can have things in such shape that he can get at his facts, and he can easily learn to show them in free-hand drawings, on an enlarged scale, in one direction, or have no scale at all, but simply show what he wants, and put the figures in, and he has got his facts. If we are all going to be draughtsmen like some of the engineers of our body, then we must make provision for a proper course of study, and follow this plan up. I confess that I would not want to start in now to make a finished drawing, for my hand is "out," and the work would be slow, and the young men in my office can do it better and quicker; but still I would be able to go to work and make the original record sketches, and do it rapidly; and I think there are very few men in this room who have less facility than I have in this direction. I sincerely hope that the members will not be discouraged from attempting to follow Mr. Shelton's advice.

Mr. Chollar—The paper of Mr. Shelton pleases me in a very high degree; and many of the points made in it are those which I have been trying to solve for many years. I agree with the gentleman who has just preceded me in thinking that there are very few engaged in the gas business, who are willing to devote an hour or so a day to a systematic record of their works, but will find that in the course of a year or so they have accomplished great things. There are one or two points in the paper with regard to keeping of the record that personally I have found not to work well. One is in recording the lines in colors. Most people might succeed very well in it, but I have found myself unable to follow out the plan. I know I am partially color blind—and many people are so who do not know it—and I find that colors are not as reliable as characteristic dotted lines and marks. Another point is this: It is necessary to have two maps, one on a small scale—a bird's eye view—and another on a larger scale for giving detail. I have worked at this latter a great deal, and do not know yet if I have got the thing right. We find a necessity of keeping the record on a large scale in such a way that it will not duplicate any part of the pipe system. I will make a little sketch (see diagram) on the



blackboard to illustrate what I mean. In making a sectional plat of a pipe system, it is a little difficult to get it so that on any two sheets you will not have some part of the system on both. If you have any part on two maps, it leads to confusion. I have a plan which I have at last adopted, and it economizes space a good deal. For instance, here is a street intersection. Now, suppose that we have a main going down this way, another one going that way. If we make a general map in sections we are liable to get some part of the pipes on two or more sheets. My system is to stop right at the line (property line) here, and here, and here. This part of the plat takes in only the interesection of the streets, and is for convenience put at one corner of the sheet. That part goes across the block from one property line to the other. This is the street crossing the other one, I put it here at right angles with the first. We do not put down the inside of the block at all, but simply the street. This gives plenty of room for dividing off for lot lines, and it is not possible to duplicate any part of the mains on any of the maps, and by reason of leaving out the inside of the blocks, you have plenty of room for putting in memoranda about the surface, etc., and can use up the paper to the best advantage. I have finally come down to this plan, and would like to have the gentlemen criticise it. I would like to say that on the street corners of the large scale plat, I put the elevations of the curb stones, the corners of the blocks, and also the elevation of the pipe lines and the water pipes.

Mr. A. C. Humphreys—I would like to ask now, after having had it explained by Mr. Chollar, if any man in the room cannot get up and make that sketch.

Mr. Egner—I think that anybody in the room can do it as well as Mr. Chollar. (Laughter.)

Mr. Chollar.—I see that I have made a mistake, and have shown one of the pipe lines on the wrong side of the street. I do not think that Mr. Egner could make a sketch like it. He is always so busy that he can't find the time.

Mr. M. S. Greenough—I agree with Mr. Humphreys that it is not wise to let the impression go out that this matter of putting our data on paper in the way suggested by Mr. Shelton is something so difficult that we cannot all do it. Mr. Shelton has taken all the maps which he has seen in our office in Boston, and I am quite sure that he has been examining our archives as well as what he has seen upon the wall; because I think that we have on paper practically everything that he has suggested, with the possible exception of one of the diagrams. I think that a diagram at the gas works, showing the make of gas by weeks, rather than by the month, is a still more instructive diagram than that of Mr. Humphreys. We also have diagrams showing the increase or decrease in the labor account per 1,000 feet of gas made; and also the cost of handling the coal, and other things which perhaps are not necessary in small works, but which are interesting as showing just what is being done. The only criticism that I would make would be this: I think it is very doubtful whether it is worth while to put on to any map anything except the gas pipes; and I also question to some extent the use of the various colors. That is a thing that we have been trying, and I have vainly endeavored to accustom myself to it. Our old maps were always made with the gas pipes colored red, and I find it very difficult to look at a map which is colored red, brown, yellow and green and to keep in my mind that any of those pipes are gas pipes except as indicated by the red color. It is at any rate much better, if quite a number of different colors are put on a map, that there should be no pipes on it of any kind except for gas. I have in my office a map showing the whole territory of our city, with all the suburbs, on which no pipes appear which are less than 12 inches diameter, and that is the map which I find I use a great deal more than any of the other maps. I find that the detailed maps which are in the Assistant Engineer's office, and which contain all these different colors, and showing the gas pipes, water pipes and sewers, so confuse me that it is very difficult to use them as readily as I can the old-fashioned map, on which there is nothing except the gas pipes, and they are in red. It is quite easy to make a map in which there shall be a number of dots showing the sizes of pipes until you get up to 18 or 24 inches; and you can read such maps just as readily and quickly as you can any combination of color. I take no other exception to the paper, and I think it is an admirable thing to carry out so far as we have time to do it.

Mr. Adams—I think, perhaps, no one has greater cause to know the great difficulty in keeping records, particularly with regard to the classification and the earlier processes of gas making, than I have; and I think that if there could be a general move in the direction of keeping records of comparative yields, and particularly of the yields of residuals under certain conditions (which are now becoming a great factor in the question of gas making) it would be one of the best things that could possibly be done by this Association; and if these results could be compiled, brought here and exposed at the meetings, I am certain it would be productive of great good. I heartily second Mr. Shelton's appeal for more systematic and exhaustive records of the work done by the various gas companies in the United States.

Mr. Harbison—I want to state a personal experience of the value of just such maps as Mr. Shelton has suggested in his paper, to emphasize, if possible, what he has said on this subject. I thought years ago that I had a pretty familiar knowledge of the Hartford gas works, and of their property. Four years ago or so I undertook the work of laying a larger distributing main or feeder across the city, and to do the thing properly I began at the fountain head—at the gas works. I thought I knew where every pipe underground was located, and about its depth below the surface. But it took me several weeks, with a large gang of men, before I could get outside the yard into the street, in order to get the system in the gas works as it should be and as I wanted it—simply and only because my knowledge of the matter in my memory was at fault. The pipes had originally been laid by the former manager. They were laid at every angle, and at every conceivable depth. To-day I would not have any difficulty in finding any of the pipes in the gas works, and not much difficulty in finding any in the streets of the city, because I have carefully prepared maps. Quite a number of years ago it was my pleasure to visit the office of the Providence Gas Company, and there to interview my friend Mr. Slater, who is an encyclopædia in gas matters himself; and the statistics of his office are as complete as they can be. In his office I saw such a chart with regard to output as Mr. Shelton alludes to in his paper, and when I returned home I deputized the duplicating of that work to one of the young men in the office, and we have kept it up ever since. I should regret exceedingly if that chart were destroyed. I also set him at work (because he then had some leisure) in making a map of our street mains, and I find that it is of exceedingly great value. I thought I knew just where every street main in Hartford was located; but we have so added to our pipes, the water company have added to their pipes, and the sewer pipes have been so multiplied, that without the assistance of the chart we could not tell just where our pipes are. I have kept a record of them all on our books, and it is of exceeding great value. The cost of doing it will be ten times repaid, even if you have to employ an engineer or draughtsman to do it for you. In five years every man in this room would save more than the time and expense required for making such a map, even if he has to go outside and hire the work done by a draughtsman. I have felt repaid the cost many times by the annoyance which has been saved me personally in managing our business, in being able, in the street or in the office, to instruct the foreman just what to do, and in being able to know myself where things are, and to make my plans accordingly. I would advise with regard to the street mains map that your foreman, and you yourself, should have it in mind continually, and every time you see the surface of the ground broken for any street connection, by anybody, or any excavations whatever made, to get the measurements to your own pipes, and to verify those measurements, and also verify the positions of the water pipes and of the sewer pipes; so that whenever you have to put in any new pipe you will know just what grade to make it in order to make it work successfully. There is not a suggestion in Mr. Shelton's paper which is not of practical value to every man in this room, and to every man connected with our business, whether he is here or absent. I think it is one of the most valuable papers that we have had before us for many years; and when the proper time comes I am ready to raise both hands for a vote of thanks to Mr. Shelton.

Mr. Ramsdell—I have been using that system for keeping the records of the amount of gas sold, etc., and I have found it practicable. I think in works where there is not a very large increase, and the lines intercross each other so much, it is a good plan to take a trial balance paper, which has 12 columns, and put the names of the respective months at the heads of the colums, with the years at the side, taking one sheet for each of these items that you wish for comparison, and then, by simply filling in the figures each month, you have the whole thing on one sheet for as many years as you want it; and you have it perfectly plain. Take any month, and, by looking right down the column, you can see just exactly how the gas in that time has fluctuated, either in the amount of gas sold or in the output. I have found this to work better in my own case than using a diagram.

Mr. Harbison—May I say a word further, on another thought that occurs to me? It is not to be expected that any gentleman in writing a paper for the Association, of a practical nature, of this kind, can outline the details of a plan which will suit every works. What is wanted for the city of St. Louis, with its large business, would not perhaps be just as practical in all its details for the city of Hartford; and what would be advantageous for us in Hartford would not be just the thing for some other works not as large as ours. But when you get the general idea, every man can then work it out and keep his details according to his own requirements as will be best for him. It is a general idea that I think Mr. Shelton wants to impress upon you—to get us all started in the right direction, if we have not already commenced; and then every man can work out the details to suit his own convenience, his own wants, and his own requirements.

Mr. John Young—In the natural gas business it is somewhat of a difficult matter to keep a record of the manufacture of the gas. The works are so situated that they are not very easily got at, but in distributing the gas we have to exercise considerable vigilance and care. The gas being carried at a comparatively high pressure—a much higher pressure than illuminating gas is—we have consequently to exercise more care in the case of leakage, and the gas having no odor makes it still more dangerous. The plan that I have pursued with regard to the pipe laying has been this: My foreman keeps a record of every day's work. If he is laying a piece of pipe he notes the depth at which it is placed, the distance from the curb stone, the location of the valve, of the joint, of the branches—exactly where they are situated—and at the end of the month he sends me in a report of all the work that has been done during the month, for every day in detail. That report is given to the typewriter, printed, and put on file; so that we could begin to-day and make a correct report of every pipe in our streets from these records. At various times these reports are taken to the draughtsman, who puts them into the maps. We have a complete record up to within a month or two of every pipe that is laid, and of every valve and connection in the city of Allegheny. I find, as Mr. Harbison says, that to trust to memory is a very deceptive thing. I sometimes think that I know exactly what size of pipe is in a certain street, but when I examine the map I find that I am mistaken. I find sometimes that it is a 6-inch main when I thought it was an 8 inch, or vice versa. I do not know that there can be anything more important for a gas superintendent to have, than a map of every pipe that he has, and of all the data that he can get to bear upon it. He will find that it will be of great importance and assistance to him.

Mr. Littlehales—It seems to me that the logical result of the paper, and of the discussion that has followed, to paraphrase an old remark, will be that from this time those of us will figure who never thought of it before, and those who always figure, now will figure all the more. (Laughter).

Mr. Hambleton—The paper has my very decided approval, and is very much in accordance with my practice, except that it is carried out in more detail in some respects than I have been doing. I have been placed in a position where I have had to do a very extraordinary amount of pipe laying, and have had a good deal of pipe taking up to contend with; but I have managed by dint of regular records to keep a thorough account of it, and have verified the accuracy of our maps, when changing the prices in different districts where a new company laid some hundred miles of pipe. A map was made and put down in the office below stairs, showing all the new pipe, and when a man came in to have his price changed because he lived in the opposition district, it coincided almost exactly. I have been obliged to keep a map of all the companies which have come to lay pipes in our territory (as well as of my own), and without that map we would have been absolutely lost, or in a hopeless tangle. But by dint of keeping such a record, and having everything in the way of pipe laying brought in and put on the map as soon as it was done, we have been able to keep our systems all separate and in perfect operation. One thing in addition to the locating of stopcocks that I have done is having an arrow showing the direction in which the screws turn. I have the book which has been suggested with a sketch of the location of all the stopcocks, and arrows to show the direction, so that any man can take that book and locate a stopcock, and turn it either shut or open with certainty. In the matter of the recording of data, I may say I have done a great deal in that line, and find it pays, most decidedly. It has enabled me to make changes and improvements that I could not have made otherwise. I can only say I have no doubt that the paper of Mr. Shelton will be fruitful of a great deal of good. I have myself been greatly benefited by whatever I have done in that direction.

Mr. Shelton—I am very thankful to the gentlemen who have spoken so kindly of my paper. I will reply to two or three points which have been suggested. If Mr. Young's works are so much covered under the dirt that he cannot see them, and if they are in such a warm place that he has very little familiarity with them, that fact does not lessen the suggestion of my paper of the importance of having a record of what he does know about them. He can make a beginning, and adopt the practice of Mr. Harbison, and every time he gets a chance to put down another point, put it down, and then in the course of a few years he may have a complete record. In reply to Mr. Greenough's remark about the colors on the map, I will say I am not here to lay down any empirical system, but simply to make suggestions. The company that I am con-

nected with has found the system of coloring suggested in the paper to work very advantageously, and I recommended that. But of course there are many other ways which I presume are equally as good. Brother Mooney raised the point that a gas engineer should not be a draughtsman. I do not agree with him in that. I will say, however, that if any of you have no time to devote to that work, Brother Mooney is a very excellent draughtsman, and his address is 94 Liberty street, New York, and in case you want anything done in that direction you can give him a call.

On motion of Mr. Boardman the thanks of the Association were voted to Mr. Shelton.

[To be continued.]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE people of Montreal are complaining that the quality of the gas supplied them is not only poor, but that its use is dangerous to health, etc. Of course there is no reasonable foundation for these charges, hence their iteration must be peculiarly galling.

ON November 11th there was filed at the office of the Secretary of State, at Trenton, N. J., articles incorporating the American Light and Fuel Company, with offices in Jersey City and New York. The Company is capitalized in $500,000, and according to the articles it is organized for the purpose of "manufacturing and constructing plants, machinery and tools, and to develop processes for the manufacture and production of gas for light, heat and power."

SOME days ago a fire was discovered on the top floor of the office building occupied by the New Haven Gas Light Company. Brother Sherman, however, will not have to call on the insurance men to go very deeply into their pockets, as the damage amounted to less than $500. It might have been a bad fire, though.

ACCORDING to the report submitted by the Treasurer of the Fort Wayne Electric Company to the stockholders, regarding the business of the Company for the six months ended August 31, we find that the sales, exclusive of all commissions, amounted to $867,545, with net profits of $161,207, and that the surplus was increased by $71,207, the total of same being now $243,541. The increase in the number of local Companies using the Fort Wayne system during the past 6 months was 24, making the total number at present 128. The manufacture of dynamos and lamps is hereafter to be carried on at the Company's new factory at Fort Wayne, which will likely result in the closing of the old shops at Brooklyn, N. Y.

MESSRS. BARTLETT, Hayward & Company, of Baltimore, Md., will build the holder for the new Kings County Gas and Illuminating Company, and the American Meter Company is under contract to put in the station meter. Engineer Byrne means to give plenty of gas to the people of New Utrecht, and without any loss of time over it, either.

IN response to invitation of City Councils, of Utica, N. Y., for tenders for the public lighting of that place, for a term of 3 years, from January 1, 1891, the Utica Electric Light Company proposed to furnish any required number of 2,000-candle power lights, lights to burn an average of 10 hours per night during the year, at the rate of 35 cents per light per night. The Utica Equitable Gas and Electric Light Company submitted the following proposition, through its President, Col. R. M. C. Graham: "The Equitable Gas and Electric Light Company hereby offers to light with gas and clean and extinguish 950 gas street lamps upon the line of its mains in the city of Utica, and to furnish the same with burners of a capacity of not less than 4 feet to the hour, and to keep the said lamps lighted from dark until daylight for 365 nights per year, so as to make an average lighting of 4,000 hours to the lamp in each year, for the term of 3 years from January 1, 1891, at and for the sum of $20 per year for each and every street lamp so lighted. And the Company further agrees that the gas so furnished shall not be less than 25 candles illuminating power. 950 gas lamps at $20 per lamp will amount to $19,000 per year. According to the experience of the city of New York, and the rule adopted by that city, 4 gas lamps are equal and equivalent to 1 arc light. The city of Utica has now 367 arc lights; 950 gas lamps are equivalent to and will displace 237 arc lights; 130 arc lights distributed in the localities outside of the lines of our mains would cost, at the present rate ($127.75 per light), $16,607.50. The city, therefore, would get by this method gas light for $19,000, and electric light for $16,607.50, or a total of $35,607.50—a saving of $12,000 on the present contract per year, or $36,000 in 3 years. * * *. We will furnish such other gas as may be necessary for the gas street lamps upon our mains hereafter constructed by us at the same rates as herein set forth, and will give such bonds as the city may require that the light furnished shall be satisfactory. In closing, we would remind the Council that our Company owns large works in the city, and pays here now over $7,000 for taxes." A rather spiritless discussion followed the reading of the proposals, which was finally terminated by the adoption of a resolution awarding the contract to the Electric Light Company, for a period of 3 years, on the basis of 400 lamps at the rate of 35 cents each per night. There is no doubt about it that the local Electric Light Company finds high favor in certain political circles at Utica, circles that are in power, too. In fact, it looked a trifle odd to see ex-Mayor Kinney (he was Mayor when the lighting was first handed over to the electricians) acting at the Council meeting in the capacity of a paid representative of the Electric Light Company. Perhaps this was in instance of his zeal for the taxpayers.

THE Central Gas Company, of San Francisco, has declared and is paying a dividend of $1 per share.

THE following, from the Philadelphia *Record*, of recent date, is amusing and instructive: "Every year the United States Treasury Department makes new contracts for the lighting of the public buildings that come under its control. This year the Sawyer-Man Electric Lighting Company secured the contract; last year the Edison people had it; the year before the United States Company supplied the light. Each of these transfers of contract necessitated a change of lamps, costing the Government nothing, it is true, but putting Government employees to great annoyance. The whole expense of these changes, amounting to thousands of dollars, falls upon the electric light companies, but so great is the rivalry among them that the cost is disregarded for the sake of the prestige of obtaining the contract. Some idea of the expense and trouble annually undergone may be had from this epitome of Government lighting by electricity. Three years ago the United States Electric Lighting Company had the plant and the lighting of the Philadelphia post office, and of post offices throughout the United States where electric lamps were used. The next year the Edison Company put in the lowest bid, and obtained the contract for lighting buildings owned by the Government which are under the control of the United States Treasury Department. The Edison Company uses a different brass socket for incandescent lamps from the United States Company, the globes in the former being fastened by a screw, and in the other by a spring. The change of contract necessitated a change of sockets. This year the Sawyer-Man underbid the Edison. Their globes do not fit the Edison sockets, and now all through the country in Government buildings there is another change of sockets."

MR. G. H. SUMNER, who served the Birmingham (Ala.) Gas Company faithfully and well as Assistant Manager, has taken service with the local Consolidated Electric Light Company.

WE can now state officially what we hinted at before in our last issue respecting certain changes that might be shortly made in gas rates at Milwaukee, Wis. The meeting of the Board of Directors at which the action was determined was held on the 13th inst., when it was resolved that on and after January 1st illuminating gas would be sold for illuminating purposes at $1, net, and for fuel purposes at 80 cents, net; bills being made at $1.20 and $1, respectively, with a discount of 20 cents in each case for payment within 10 days.

WILLIAM FAY and C. S. Gerlach are said to have applied to the authorities of Elgin, Ills., for a franchise for a gas and electric light company.

MESSRS. JOHN F. SCOTT, O. C. Pudan, C. B. McLean, Thos. Woods and Geo. W. Simonds have incorporated a Company at Pittsburgh, Pa., to go on with the manufacture of meters for natural gas. The shop is to be in the building formerly occupied by Sterritt & Thomas as a machine shop.

THE proprietors of the Northampton (Mass.) Gas Company have no reason to be dissatisfied with the progress that is being made in their business, 22 meters having been put in service since July 1st.

DEPUTY SHERIFF A. M. TYLER, of Athol, Mass., acting at the instance of the Thomson-Houston Electric Company, recently attached the property of the Millers River Gas Company. The sum named in the levy was $2,000.

MR. M. HALL STANTON, ex-President of the Philadelphia Board of Education, and a former member of the Board of Gas Trustees (he was

chosen a Trustee in 1867, and served continuously until the Board was abolished in 1888), died at his home in Philadelphia on the evening of Wednesday, Nov. 14. Deceased was born on the Eastern Shore of Maryland in 1833, and was originally in mercantile life at Wilmington. He subsequently married the daughter of Wm. Anspach, of Philadelphia, and removed to the latter city, associating himself with his father in-law in the banking business. During his membership on the Board he served on nearly every important committee, and was several times Chairman of the Committee on Works and Finance, and no more popular Trustee ever served the city. He was universally and deservedly esteemed.

MR. B. B. BURBANK, has resigned the Superintendency of the Wakefield and Stoneham (Mass.) Citizens Gas Light Company, in whose service he has been for over 20 years.

A CORRESPONDENT writes that it is quite probable that the Committee on Street Lighting, of Charleston (S. C.) Councils, will recommend a renewal of the current public lighting contract. This calls in round numbers for 120 arcs, at an annual payment of $10,000, and 812 gas lamps, at $15.75 per annum each. A moontable is followed.

A DECISION and opinion just handed down by Judge Archibald, of Lackawanna, Pa., is of considerable interest and importance. In his opinion, rendered in the case of the city of Scranton vs. the Scranton Electric Light and Power Company, the Court, in brief, holds that the property necessary to carry out the corporate purposes of a corporation engaged in business of a public interest is not liable to local taxation, where such property is included in the capital stock which pays a State tax. That only those corporations which owe a well-recognized duty to the public, and which hold their property and exercise their franchises in subjection to that duty fall within this class. That an electric light company, incorporated under the acts of April 29, 1874, and June 2, 1887, to supply light, heat and power to the public, belong to this class; and its lands, buildings and appurtenances necessary to carry out its corporate purposes, are exempt from local taxation where such property is included in the capital stock which pays a State tax.

WE are indebted to a correspondent for the following respecting the new gas works at Port Townsend, Washington: "Gas was turned into the mains of the Port Townsend Gas and Fuel Company on the afternoon of the 8th inst., and with that fact accomplished the inauguration of a new enterprise in this city was recorded. Although several franchises have been granted to those who proposed to build gas works here during the past 15 years, from one cause or another nothing substantial ever came from them, until the one that followed the advent of Mr. John Lillie was obtained. Mr. Lillie, of Fort Wayne, Ind., while on a summer outing trip happened in on us here, in August, 1889, and remained a fortnight or so in the city. During that time he became impressed with the possibilities of Port Townsend, and concluded that it would be a very likely spot to settle in. In the October following he returned to Port Townsend to remain permanently provided some eligble business opportunity presented itself. He looked the field over carefully and in January, 1890, determined that we should have a gas works. Others were speedily interested in the scheme, and a formal application to councils for a franchise was in time approved. The company was named the Port Townsend Gas and Fuel Company, and it was capitalized in 50,000. The officers are: Oliver E. Fleming, President; T. J. Nolton, Vice-President; John Lillie, Secretary and Manager. It was an open secret that the residents of the city did not believe that the franchise would be availed of for some time at least—since they had heard of many such schemes before—but plans and specifications were at once prepared, and contracts were awarded. On May 1st construction work was commenced, and had it not been for numerous and unavoidable delays in the receipt of material the works would have been in running order at least two months ago. However, now everything is in good running order and the people are more than pleased. The retort house is a substantial brick building, 31 by 33 feet, by 22 feet high, and at present contains three beds of fives, only two of which, however, will be operated. The apparatus is of the best possible description, and is ample for the supplying of gas to a place holding 25,000 inhabitants. One decided novelty in the construction is the holder tank (26 feet deep by 56 feet in diameter) which is made of planed California redwood, the sticks being 4 inches in diameter. It is encircled by 20 4 inch by ¼-inch iron bands, and I do not believe I am far out of the way in saying that it is the largest wooden tank in the world. So far 27,295 feet of pipe, of all diameters, is available for work, and 100 consumers are on the books. The rate per 1,000 cubic feet is $3.50, with a discount of 50 cents per 1,000 to all who use 5,000 cubic feet and over per month. The Company is likely to become a popular institution, as its incorporators are, with one exception, residents of the city. Another novelty in connection with our Company is that we have gas before electricity, and I am sure that no one seems to regret the fact.—R. I."

MR. GEORGE B. BURNS, who has been apointed Superintendent of the Bowling Green (Ky.) Gas Light Company, writes: "We have almost a new 8-inch coal gas works here and are just connecting up a new holder. We will have an incandescent electric light plant in operation about next New Year's Day. Business is good and increasing, and we are putting in quite a number of stoves."

WE understand that Mayor Jacob has entered into a contract with the Louisville (Ky.) Gas Light Company under which the Company is to supply the city with 150 high candle power arcs. The bid was at the rate of $66 per light per annum, which figure was away under any of those submitted by others who made tenders. The Company will put up 50 or 60 of the lamps at once, the balance to be in position by June 1st. The initial lamps will be supplied by current from the old plant of the Louisville Electric Light Company, which has been for some time owned by the Gas Company.

ABOUT a fortnight ago the franchises and plant of the Greencastle (Ind.) Gas Light Company were sold at auction, pursuant to an order of the Court. The highest bidders were Messrs. Rumsey, Green & Co., of St. Louis, who secured the property at their offer of $20,000. This sum is about $5,000 less than the face value of the bonds on the property.

THE Lynn (Mass.) Gas Company is laying mains through the section known as Linwood Park, West Lynn.

THE capital stock of the Muscatine (Iowa.) Gas Light Company has been increased from $100,000 to $120,000.

MR. C. M. AVENT and his associates have petitioned the Mayor and Aldermen of Bessemer, Ala., for the right to construct and operate a gas works in that city. The petition was referred to the committees on streets and judiciary.

THE *Associated Press* despatches, dated the 14th inst., contain the statement that M. M. Brooks has been dismissed from the Superintendency of the Findlay (Ohio) municipal natural gas plant. Mr. Brooks, it is alleged, purchased a lot of gas separators, paying $94 each for them, while he turned them in to the Company at $105 each. It is possible that the *Press* man may be mistaken in this instance, and that Mr. Brooks, who has hitherto borne an unblemished reputation, may turn the tables on his accusers. Whether he is dishonest or not, the accusation goes to prove that municipal gas and electric light establishments are always in hot water.

DURING the past five months no less than 1,358 incandescent electric lamps were destroyed by maliciously disposed persons in the districts of St. Louis that are lighted by the Laclede Gas Light Company by electricity. The Laclede Company furnishes 763 incandescent electric lamps in the northern portion of the city, and the Company says that nearly enough lamps have been destroyed during the past eight months to average two to each point where the lamps are placed, without including lamps that were worn out.

ALDERMAN HUNTER, of Kansas City, Mo., has prepared an ordinance "providing the method of locating lamps and lights for public purposes, and requiring a record thereof to be made and kept." The first and second sections read as follows:

"Section 1. No lamps or lights for public purposes shall be located or relocated except by the order of the Board of Public Works, entered upon the record or journal of their proceedings.

"Section 2. No lamps or lights shall be located or relocated unless a description of the character and proposed location or relocation of said lamp or light be furnished by the Board of Public Works."

Section 3 provides that the Board of Public Works shall keep a record which shall show (1st) the book and page of the journal upon which the original order was inscribed; (2d) the date of the order; (3d) the character of the light; (4th) the number of such lights; (5th) the location of the same; (6th) the date when actually located; (7th) the total number of lamps in use.

THE proprietors of the Jamaica (L. I.) Gas Light Company have decided to embark in the business of supplying electric currents for light and power.

THE following, from a local source, under date of Nov. 17th, gives a fairly good resume of the situation at Elizabethtown, N. J.:

"A gas war is imminent at Elizabeth, where the new Metropolitan Company is ready to lock horns with the old Elizabethtown Company, which has heretofore had all the business. The new Company, on the 16th inst., practically finished the laying of its 18 miles of gas pipes through the city, and will turn on gas before Thanksgiving Day. By December 1st the Company will be ready to supply the public, it claims, with a superior quality of gas at largely reduced rates. The old Company has accepted the gage of battle, and announces that a reduction of 75 cents per 1,000 feet of gas will be made to consumers on all streets through which the rival Company's mains run. The Elizabethtown Company's general rate is $1.50 per 1,000, and it is not likely that any reduction will be made to consumers who are on lines of mains untouched by the opposition. The President of the Elizabethtown Gas Company is ex-Congressman John Kean, who, with his father, Colonel Kean, virtually owns the entire plant, which is a valuable one. In this battle he will have the valuable assistance of Superintendent Engel. The President of the Metropolitan or opposition Company is Mr. Charles G. Francklyn; ex-Freeholder William M. Oliver, of Elizabeth, is Treasurer; and Henry Mactier—a near relative of ex-Governor Green—is Superintendent. The capital for the opposition was obtained largely in New York; and the animus of the opposition is said not to be so intertwined with plans for the 'relief' of the gas consumers of Elizabeth as it is traceable to a political difference between the Kean faction and the ci-devant Green dynasty. It would, however, not be unlike the political practices of certain New Jersey statesmen, when they could not defeat the ambitions or hamper the progress of those who opposed them in the political arena, to seek to attain their aims by crippling their antagonists in a business way. Be that as it may, the Keans, both father and son, are not cowards, hence the warfare is likely to be protracted and expensive. I think that the residents are inclined to side with the old Company—be it borne in mind that in this letter, which is partly original and partly not, I merely write as the situation seems to me to exist—and they certainly should, if sentiment is to count for anything. The old Company stood in the breach when the city was penniless, and its owners have never tried in any sense to retard the growth of what ought to be the largest commercial place in the State. However, the fight will soon 'be on,' and its varying phases cannot fail to attract the attention of the neutral gas world.—C. J. T."

GAS reformer Lockwood, of Philadelphia, says that the people in charge of the gas works in that city do not know anything about the manufacture and distribution of gas, and that their incapacity is to be made an "issue" in the next local campaign. Reformer Lockwood, however, does not seem to be in the position of an entirely disinterested critic; for when he was asked a few days ago whether he could produce a better gas at less cost than that now used by the city, he replied, "Certainly, I could. I have information that from the mixture of about 66⅔ per cent. of bituminous coal with 33⅓ per cent. of anthracite dust, which is the refuse of pea coal, a light carbon coal gas can be produced at a cost of 5 cents per 1,000 feet. I base my calculations upon the fact that a superior quality of coke would command at least $4 per ton." The trouble with Mr. Lockwood is that he would manufacture gas from "information," whereas Director Wagner and Engineer Park have to depend upon the "destructive distillation of solid and liquid matters." If Mr. Lockwood would only give Director Wagner a chance to show what he could do with "information," it is our belief that the Director would have the better of the argument. In the meantime the condition of affairs at Philadelphia is respectfully referred to the attention of the Nationalists—those of Massachusetts preferred—who would commit our cities and towns to the operation of lighting plants.

THE new rates for gas, established at Elgin, Ills., by the Elgin American Gas Company are as follows: The gross rate is put at $1.80 per 1,000 cubic feet, and prompt payment—within the first 10 days of each month—secures a rebate therefrom of 20 cents per 1,000. Superintendent Fitz evidently wishes to be close to the leaders.

AWARDS for furnishing supplies to the Gas Bureau of Philadelphia for the remainder of the year have been made as follows: 5-light meters to Messrs. Helme & McIlhenny; 20-light meters, to the Goodwin Gas Stove and Meter Company; iron sponge, to the Messrs. Connelly & Company; ¾-inch wrought iron pipe, to Whetstone & Company; malleable fittings, to Ford, Kendig & Company.

A CURIOUS "strike" is reported from Le Roy, where, something less than a fortnight ago, the lamp lighters refused to light or extinguish the gas lamps unless the rate of pay was increased. The Gas Company refused to accede to the demand, and accordingly Le Roy was left in darkness, as to its streets, for two nights.

THE following common-sense and timely circular has been issued by Mr. V. S. Watrous, Secretary of the Little Falls (N. Y.) Gas Light Company, to the residents: "As the season is near at hand when work out-of-doors will be impracticable, all those who propose to become gas consumers should make an early application for a service connection. We will run the pipes from the gas mains to the curb line, and set a meter with its connections free of charge—the consumer to pay only the cost of running the service from the street curb line to the meter. The pipes, fixtures and burners within the premises are the property of the consumer, and any alterations or additions to them must be made at his expense. But although we are in no sense responsible for the maintenance of the house lines, yet we will be glad to make suggestions in the matter of their improvement whenever we shall be requested to do so, and any work we may do, or any material we may furnish, will be charged for at a price as low as the circumstances will justify."

ARTICLES incorporating the Camden County (N. J.) Gas, Fuel, Power and Light Company have been filed by Messrs. W. L. Teter and Edwin T. Allen, of Philadelphia, and Chas. H. Allen, of Camden. The Company is capitalized in $500,000. The objects set forth are the generation of fuel for heating and steam raising purposes.

THE members of the New York Gas Commission (Mayor Grant, Commissioner Gilroy and Comptroller Myers) met last week to discuss the question of illuminating the city for 1891. All the members favored the use of electric lamps in the parks and on the prominent thoroughfares, but at figures that could not in any sense be considered exorbitant. Secretary McCormick was instructed to advertise for bids for a total of 1,386 arcs, the specifications to contain the warning that a combination among the bidders would insure the rejection of their proposals. It was the sense of the Commission that if the figures submitted were greatly in excess of the cost of doing the work by gas, that electricity would be rejected and gas adopted. The bids are to be in by December 4th, and the period of the contract is to be for 1 year from January 1, 1891.

Unmetered Matter.

"A new penny-in-the-slot contrivance has been adopted by the Gas Department of the Corporation of Birmingham, for the benefit of small consumers, and, incidentally, its own.

"The price of gas in Birmingham, as everywhere else in England, is, according to our ideas, low, the regular rate being 60 cents per 1,000 feet. Small householders, however, often like to enjoy a definite amount of such luxuries without being bound to any regular contract; while the gas company is glad to make sure of its pay from such customers by getting it in advance. To meet the wants of both parties, a sort of meter has been constructed, which, on dropping a penny in a slot, will deliver 25 cubic feet of gas. This is at the rate of 80 cents per 1,000 feet instead of 60; but the company feels justified in charging a rather higher rate to such small customers. If any of the latter wish for a larger supply, they may drop 9 penny pieces at once into the slot, and 225 feet will then be delivered, before the valve closes. The accumulated pennies are collected once a week by an official of the gas company. The burners on the house fixtures are regulated to burn 5 feet per hour but of course they can be turned down so as to burn more slowly. No direct charge is made for the measuring apparatus, the extra price for the gas delivered through it covering the expense."—*American Architect*, Nov. 8, 1890.

Upon reading of the above wonderful invention, our machine poet went into a trance and produced the following:

AT LAST.

By G. A. S. METER.

As after a storm the sun shines out
  With bright and cheerful light,
So, after years of the vilest abuse,
  My wrongs have been made aright.

The light-giving stream that through me flows
  I've measured correct; but, alas!
My figures have always been doubted
  By those who paid for the gas.

But a better day has dawned for me;
  No more abuse. Happy my lot!
Thanks to the man who invented
  The "Penny in the Slot!"

Then hail to the new invention!
  When gas is sold in job lots,
I'll be meter, indexer, and collector, too,
  In the day of meters with slots.

The Market for Gas Securities.

If it is true that all signs fail in dry weather—that is, in attempting to predict to-morrow's weather conditions from those that exist to-day—it is equally certain that he who would attempt to put Wall street values on stocks when that field and forest is swept and shaken by the panic winds, must be more than a prophet. Lack of confidence and overtrading in general contributed to break what ought normally to have been a strong market, in gas securities especially; for at no time in the past 10 years has the gas industry been stronger than it is to-day. The worst possible effect of the competition with electricity has been determined to a nicety, and the advance in economic methods of gas manufacture and distribution has far more than kept pace with the effect of electrical competition. Consolidated shows how intrinsically strong it is when the hardest sort of hammering failed to drive it below 92½, and its worth is shown in the fact that to-day (Friday) it opened at 95½. It is the best stock on the list. Chicago gas is back to 37½, after selling down to 32¾. Laclede is to-day at 12½, while Baltimore Consolidated is at 44½ to 45. The most serious break in gas shares is that reported from Boston, where Bay State was freely offered at 50. These values are all far below the real merits of the properties represented by the shares, and those who purchase now cannot make a mistake.

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None need apply unless having experience in the buying and selling of Gas and Steam Coals. Address, stating age, experience, and salary required,

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Bids to be by the net ton (of 2,000 pounds) of coal carbonized. Tar to be delivered in tar tank at works. Right to use sufficient tar for Company's own purposes, and to reject any or all bids, reserved.

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Notice is hereby given to all interested parties that the co-partnership existing between Henry J. Davison and Frank F. Jones, under the firm name of Henry J. Davison & Company, was dissolved on the 22d day of July, 1890, by the death of the said Davison.

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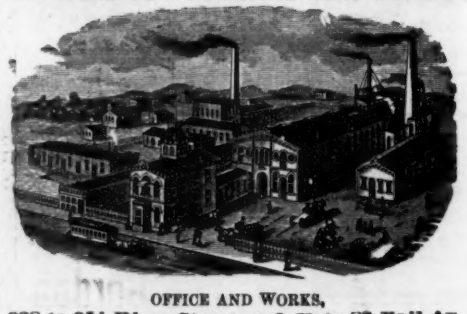

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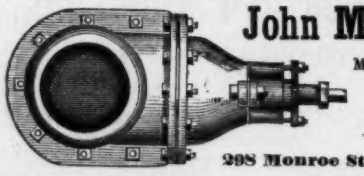

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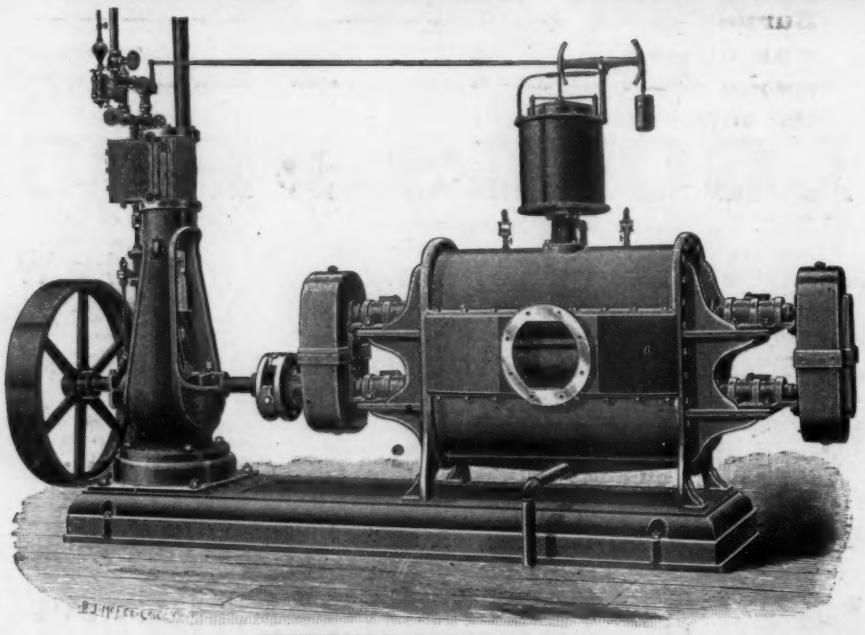

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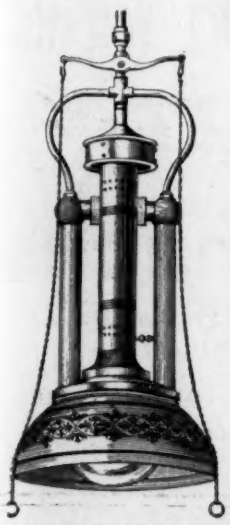
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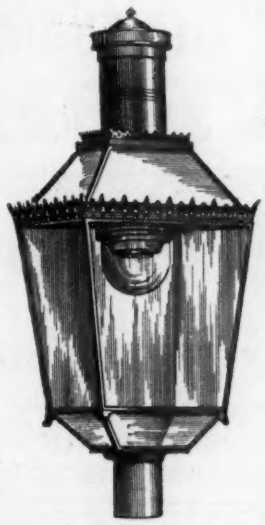
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At the Fall Session of the Board of Supervisors of Winnebago County, held at the County Court House, Oshkosh, Wis., Nov. 26, 1889, the report submitted by Mr. C. W. Cook, Chairman of the Committee on Public Buildings, recommending the use of the Welsbach Incandescent Gas Burner in the Buildings under their charge, was unanimously adopted, because of the extreme economy in the consumption of Gas and the superior character of the light obtained.

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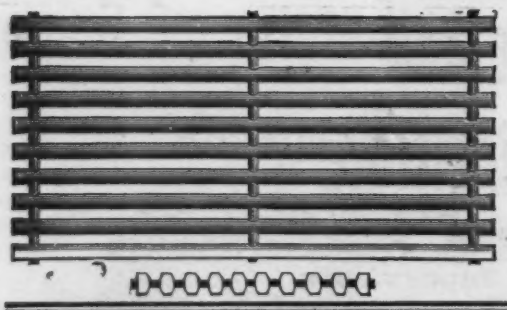

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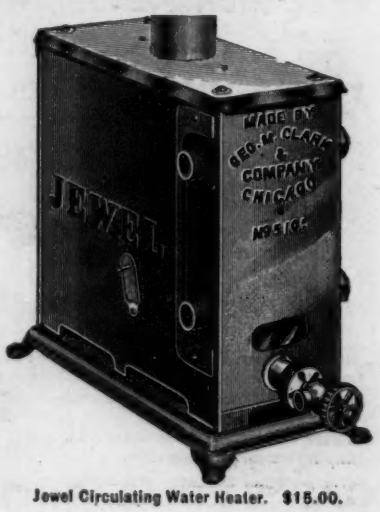

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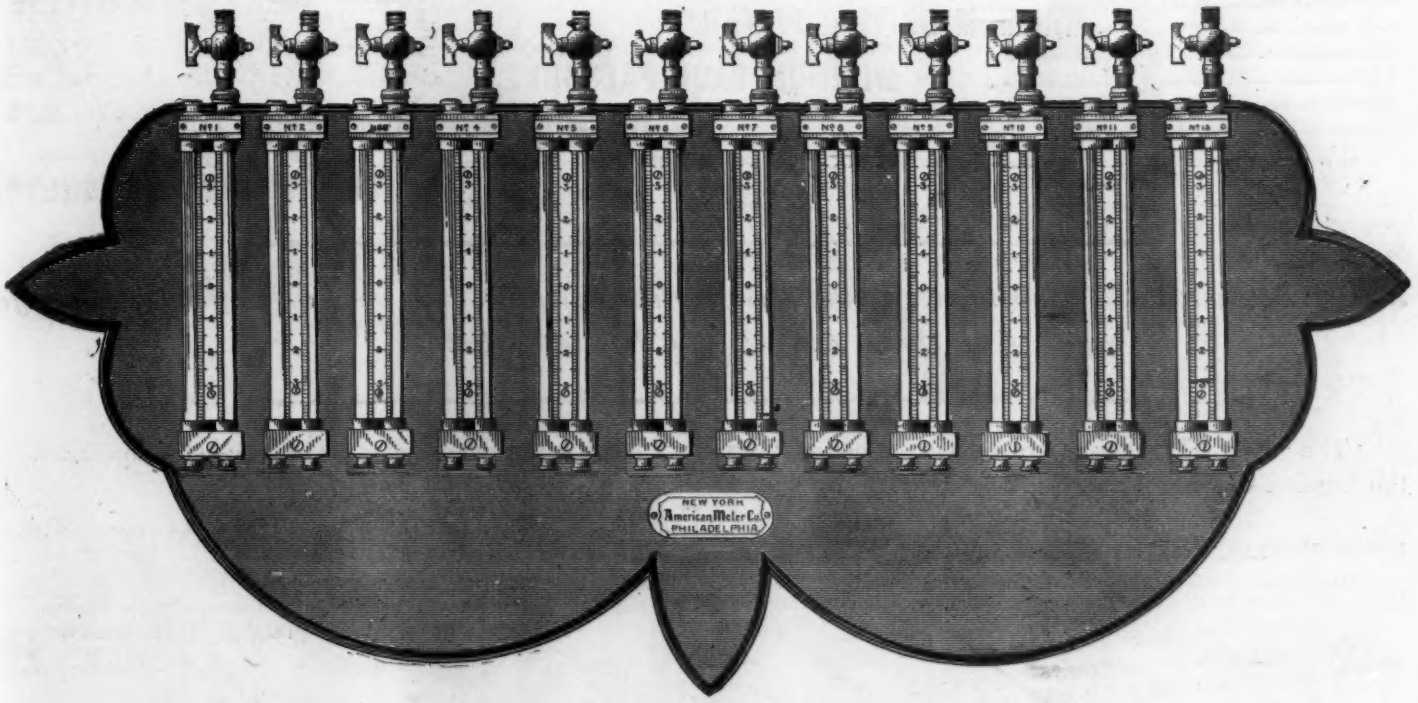

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WITH MAXIMUM RESULTS.

396 "Standards" are now in use throughout the World, and a large percentage of these are in the United States.

The "New" Washer-Scrubber, with Wooden "Bundles," has been for many months in successful operation at the London Gas Light and Coke Company's station at Beckton (*vide* testimonial).

THE GAS LIGHT AND COKE COMPANY, HORSEFERRY ROAD, WESTMINSTER, Nov. 25, 1889.

MESSRS. KIRKHAM, HULETT & CHANDLER, LIMITED:

Gentlemen—In reply to your inquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say that they have answered admirably for the few months they have been in, and I think them a decided success.

I am yours truly, (Signed) G. C. TREWBY.

THE "BUNDLES" CAN BE SUPPLIED TO "STANDARD" WASHER-SCRUBBERS ALREADY IN USE.

NOTE.—The first Washer-Scrubber referred to in the above letter was fitted with improved "Bundles" in May, 1888, and these have proved so satisfactory that the Gas Light and Coke Company have had several other "Standards" fitted in the same manner, and have recently given an order for machines for 6,000,000 cu. ft. per day.

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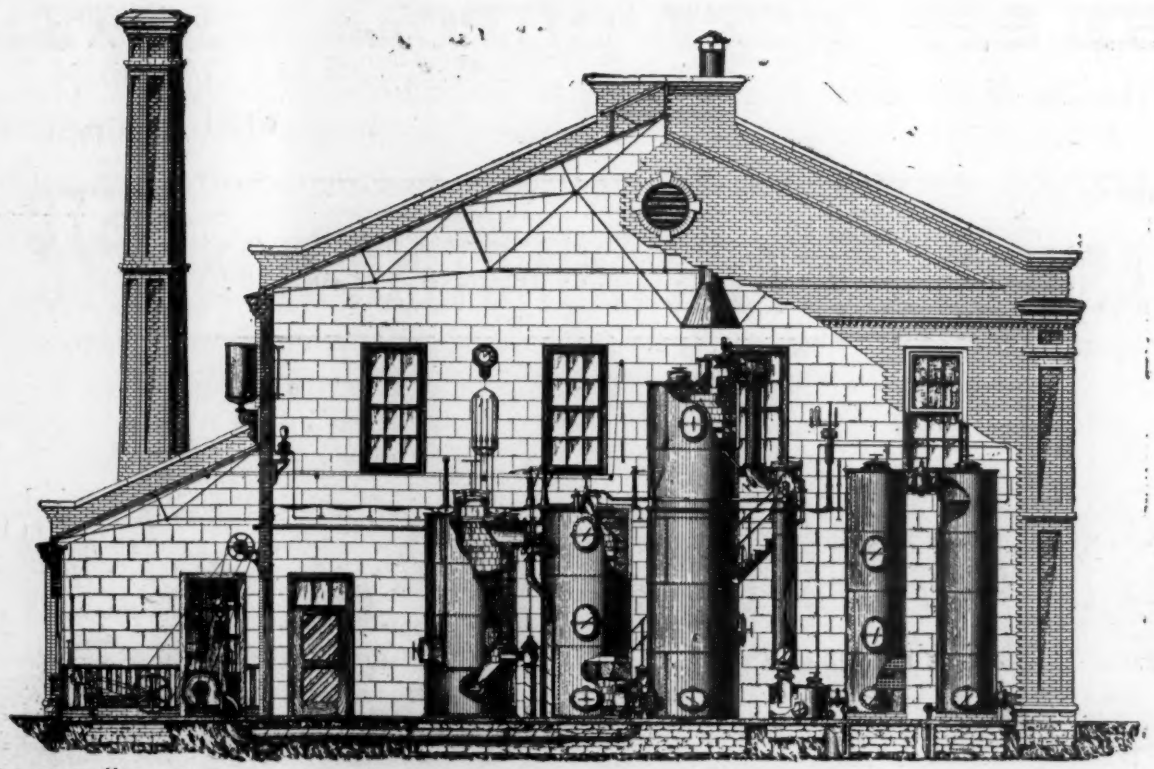

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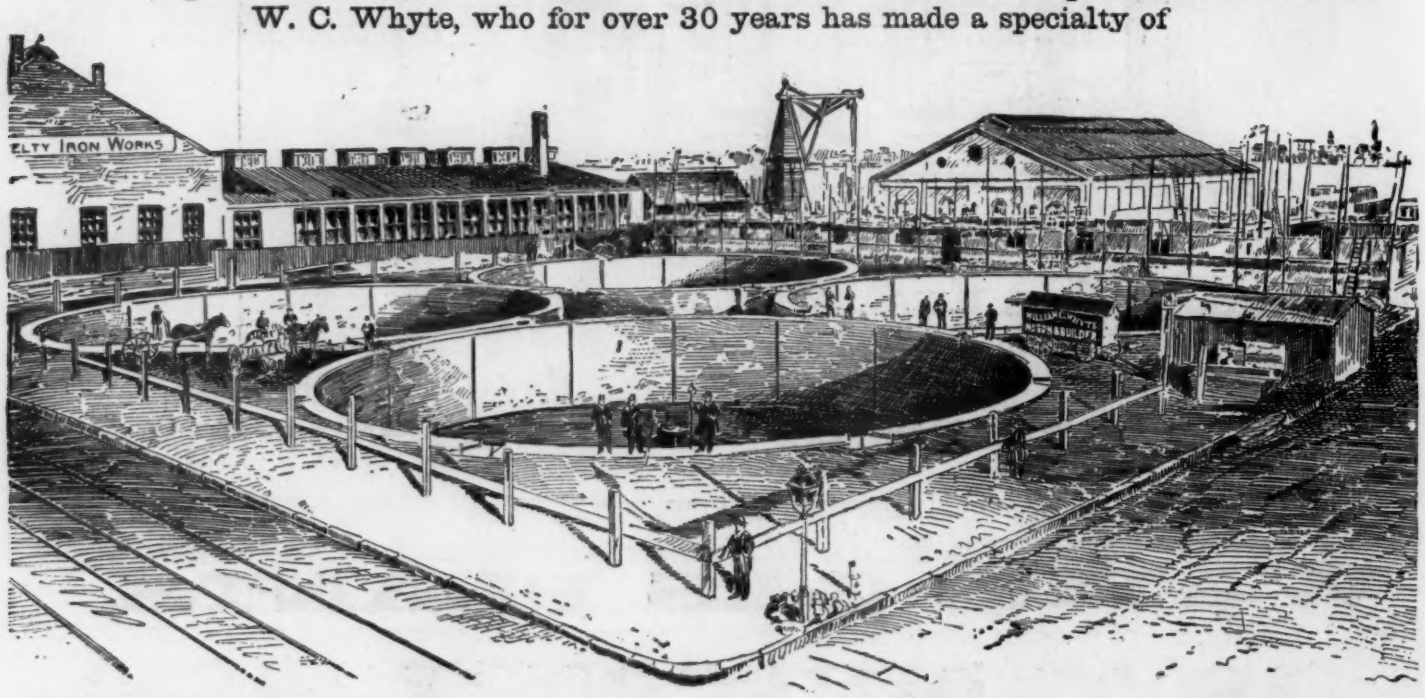

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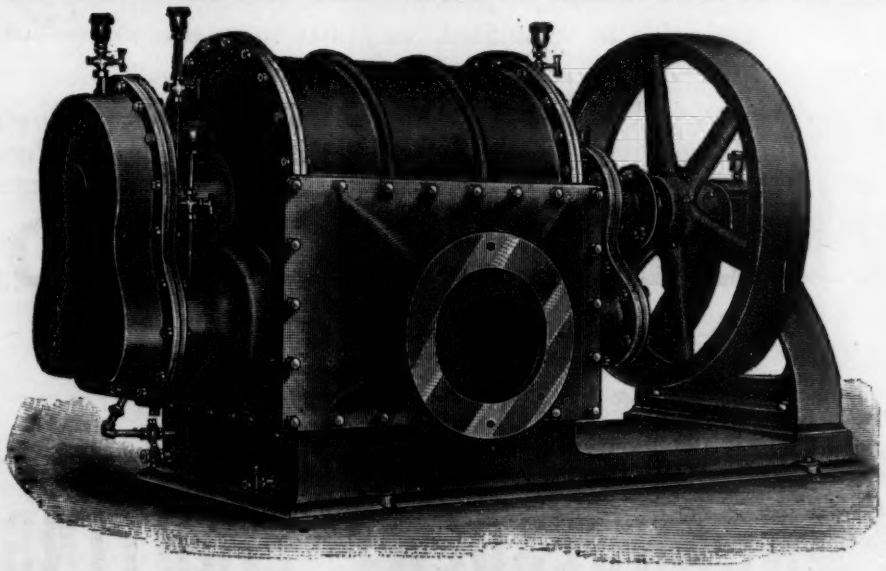

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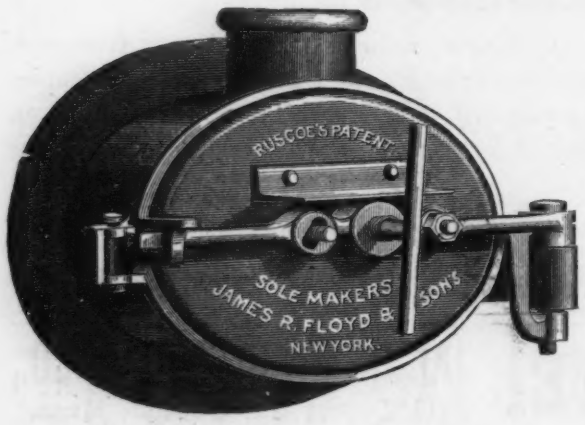

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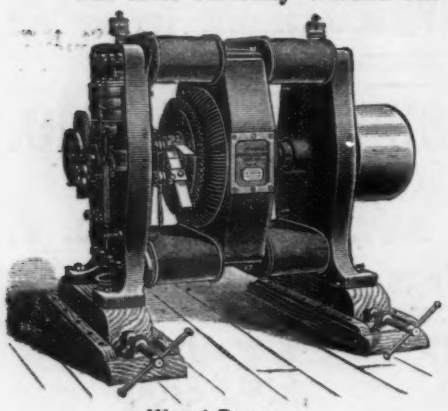

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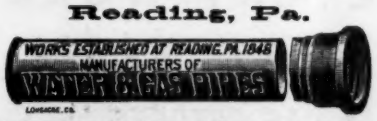

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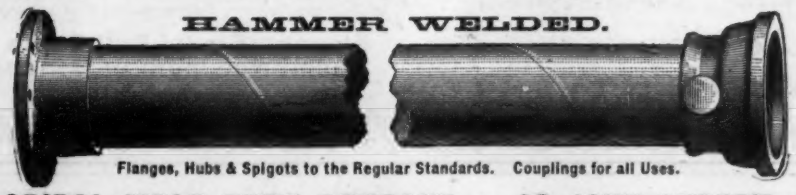

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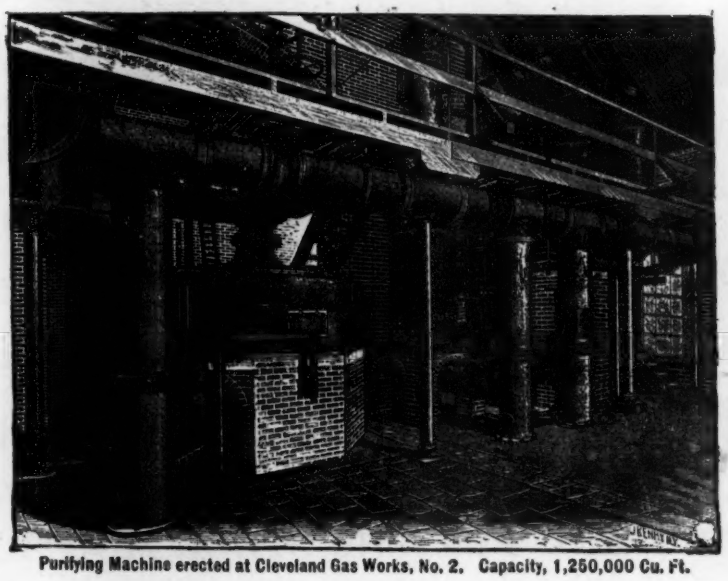

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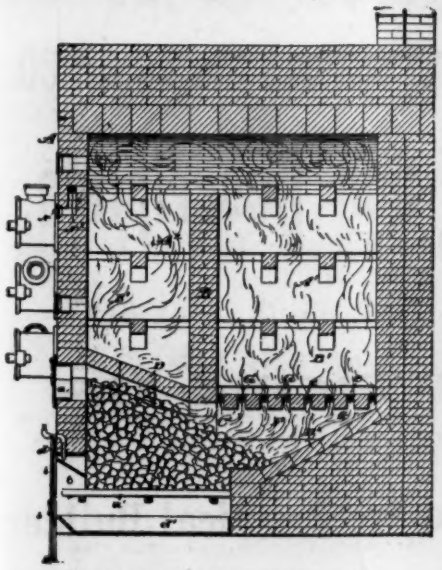

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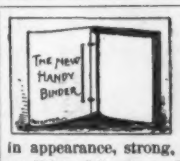

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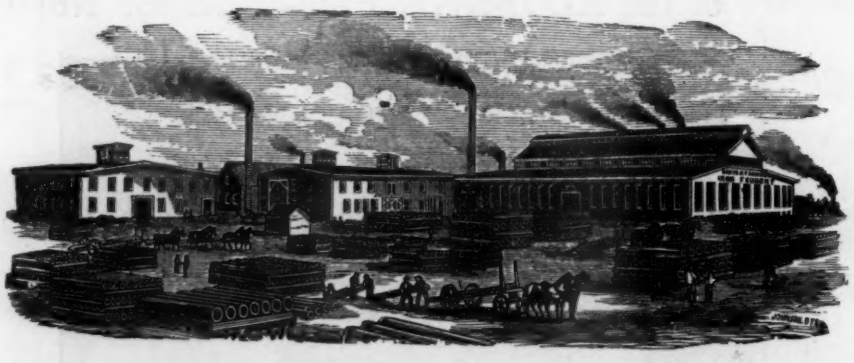

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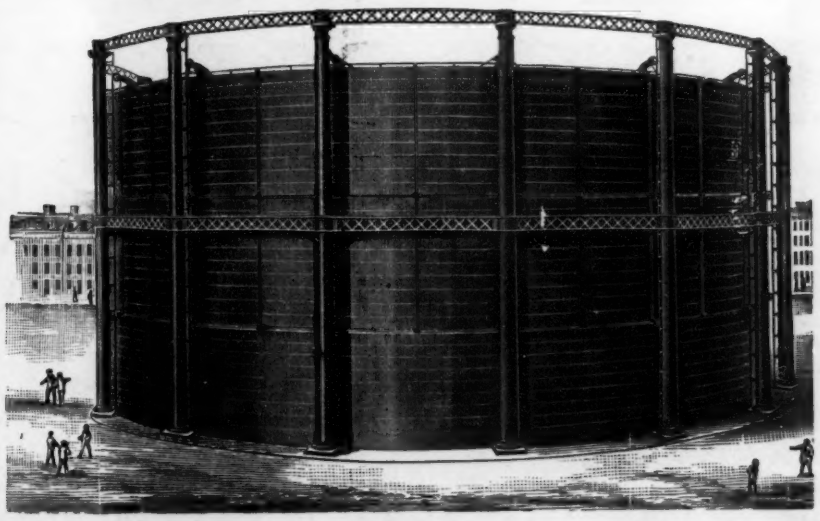

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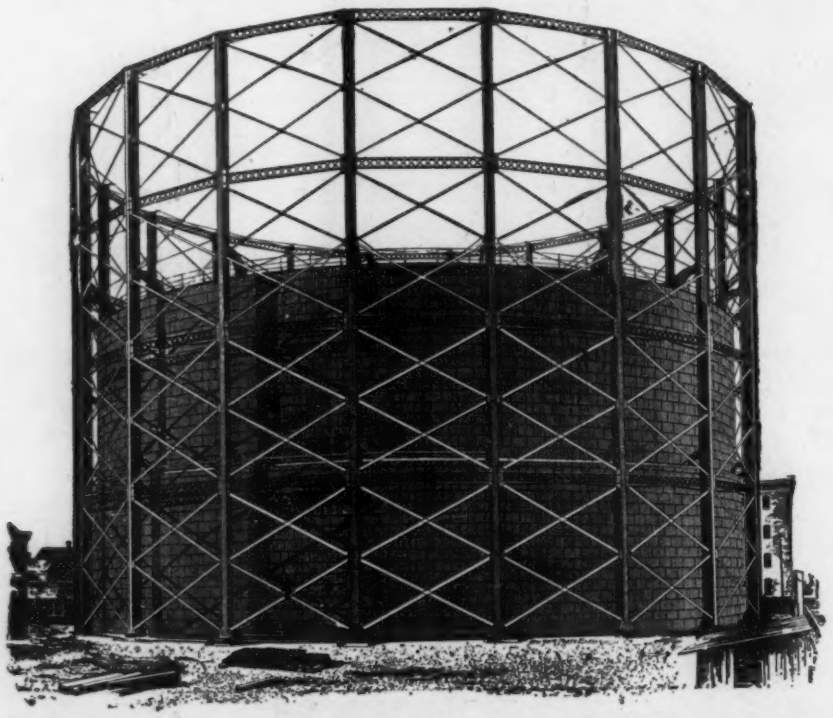

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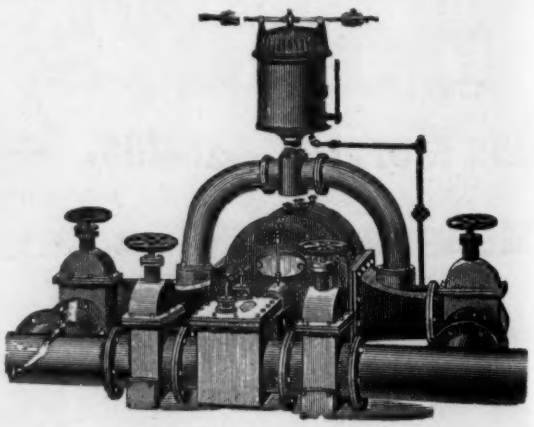

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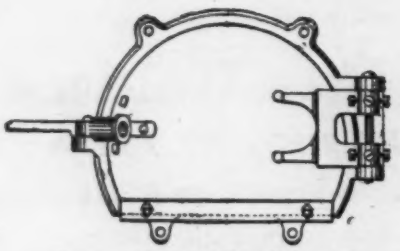

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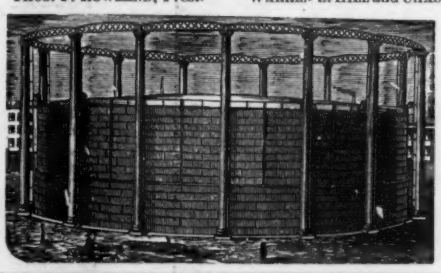
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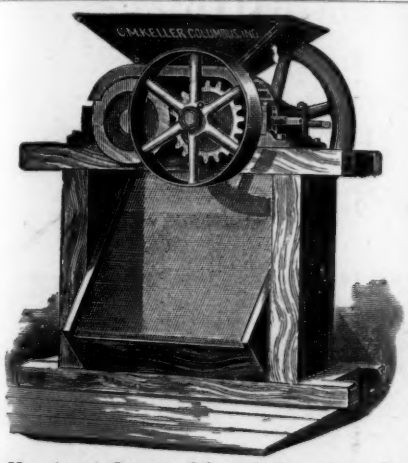

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FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**

WM. WALLACE GOODWIN, President and Treasurer. E. STEIN, Vice-President. H. B. GOODWIN, Secretary and Superintendent.

THE GOODWIN GAS STOVE AND METER CO.,

Successors to W. W. GOODWIN & CO.

1012, 1014 & 1016 Filbert St., Phila., Pa. 113 Chambers St., N. Y. City. 44 & 46 Dearborn St., Chicago, Ills.

WALDO BROTHERS, Agents, 88 Water Streets, Boston, Mass.

MANUFACTURERS OF

DRY AND WET GAS METERS,

Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc. Meter Provers (sizes 2, 5, and 10 feet), Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6, and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Center Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete. Also, Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Manufacturers of the "SUN DIAL" GAS STOVES, for Cooking and Heating.

Goodwin's Improved Lowe's Jet Photometer. **Agents for Bray's Patent Gas Burners and Lanterns.**

Special attention to Repairs of Meters and all Apparatus connected with the business. All work guaranteed first-class in every particular. Orders filled promptly.

G. B. EDWARDS, Manager, New York. S. S. STRATTON, Manager, Chicago.

D. McDONALD & CO.,

GAS METER MANUFACTURERS.

(Established 1854.)

51 Lancaster St., Albany, N. Y. 34 & 36 West Monroe St., Chicago, Ill.

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS, PRESSURE GAUGES, ETC.

Also STAR GAS STOVES, RANGES, and HEATING STOVES.

We use only the very best materials, and employ the most skilled labor, and by our long experience (36 years) and personal supervision of every detail, we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

WM. WALLACE GOODWIN, President. E. STEIN, Vice-President. H. B. GOODWIN, Sec. & Supt. G. B. EDWARDS, Mang'r, New York. S. S. STRATTON, Mang'r, Chicago

THE GOODWIN GAS STOVE AND METER CO.,

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Agents, WALDO BROTHERS, 88 Water Street, Boston.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 3 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¾ in. supply pipe should be used where the pressure is 1 in. or over.